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MECHANICAL PROPERTIES, INCLUDING FRACTURE  
TOUGHNESS AND FATIGUE, AND RESISTANCE TO  
STRESS-CORROSION CRACKING OF STRESS-  
RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

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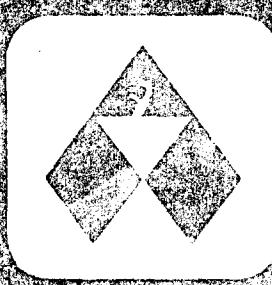
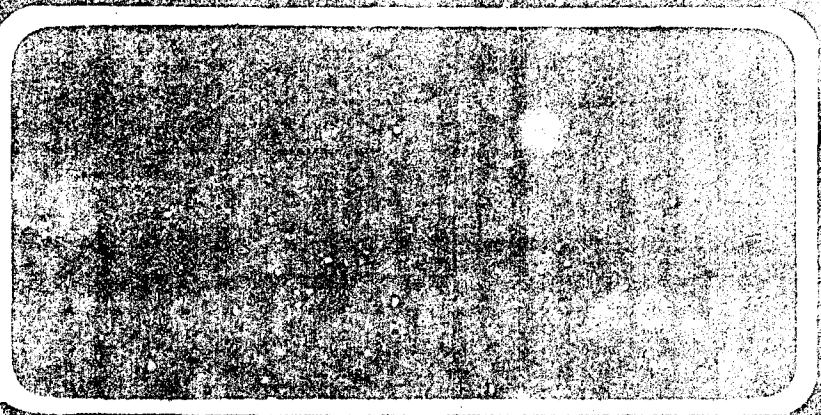
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RESULTS

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### ABSTRACT

The tensile and compressive, shear, bearing, fatigue and fracture-toughness properties of a total of 153 samples of 2014, 2024, 6061, 7075, 7079 and 7178 aluminum alloy extrusions in the TX51X and "heat-treated-by-user" tempers have been determined. The extrusions ranged in thickness from 0.050 to 6.500 in. Ratios among the tensile, compressive, shear and bearing properties have also been computed.

Stress-corrosion tests of 43 samples of extrusions have been made.

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## FIFTH QUARTERLY REPORT

### MECHANICAL PROPERTIES, INCLUDING FRACTURE TOUGHNESS AND FATIGUE, AND RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

#### I. Introduction.

The tests being made under this contract are for use in establishing design mechanical properties in MIL-HDBK-5A, including stress-strain and tangent-modulus curves, for 2014, 2024, 6061, 7075, 7079 and 7178 aluminum alloy extrusions in the TX51X tempers. For comparison, a limited number of similar tests are being made of extrusions in the "heat-treated-by-user" temper. Also, some fracture-toughness, axial-stress fatigue and stress-corrosion tests are being made.

This Fifth Quarterly Report summarizes the results of tensile, compressive, shear, bearing, fatigue, fracture-toughness and stress-corrosion tests made to date on 125 samples in the TX51X temper and on 28 samples in the "heat-treated-by-user" tempers. The samples ranged in thickness from 0.050 to 6.500 in.

#### II. Material.

A total of 138 samples of commercially-produced extrusions in the TX51X temper and 23 samples in the O temper have been received from two producers. The section thickness and identification of each sample is shown in Table I. Eighteen of the as-received samples in the O temper have been heat treated, or heat treated and aged, in accordance with applicable conditions in MIL-H-6088D. Five samples of 2024-O and 7075-O

## 2.

were tested in two "heat-treated-by-user" tempers, so that the total number of samples tested in those tempers is 28.

### III. Procedure.

#### Mechanical Properties

The specimens and procedures used were generally in accordance with ASTM methods, and essentially in agreement with Federal Test Method 151a.

All tests were made in testing machines that meet ASTM and Government requirements for accuracy.

All tensile tests were made in accordance with ASTM Methods of Tension Testing of Metallic Materials (E8-66). The size and type of the tensile specimens are as shown in Fig. 1. Longitudinal and long-transverse specimens were taken from the following locations:

Thickness, in.	Location of Axis of Specimen with Respect to Thickness (T) and Width (W) of Predominant Section	
	Thickness	Width
	$\leq 1.500$ in.	$> 1.500$ in.
$< 0.500$	T/2	---
0.500 to 1.500 incl.	T/2, D*/2	W/2, D*/2
$> 1.500$	T/4, D*/4	---
		W/4, D*/4

\* For round extrusions: D-diameter.

Also, for section thicknesses  $\geq 0.500$  and widths  $> 1.500$  in., longitudinal and long-transverse specimens were taken at the T/2, W/2 location. For round sections  $> 1.500$  in. in diam, specimens were also taken at the D/2 location. For sections  $\geq 2.000$  in. in thickness, short-transverse specimens were taken from the T/2, W/2 location.

Whenever possible, the tensile specimens from extrusions 0.499 in. or less in thickness were full-thickness sheet-type specimens (Fig. 1). The specimens from thicker shapes were 1/2 in. in diam, except where it was necessary to use subsize round specimens.

All compressive tests were made in accordance with ASTM Methods of Compression Testing of Metallic Materials (E9-67) and were made using a subpress (Fig. 3 of E9-67). The specimens from shapes less than 0.500 in. in thickness were full-thickness (Fig. 2, top). These specimens were laterally supported by a Montgomery-Templin Fixture (Fig. 4a of E9-67). The specimens from thicker shapes were cylindrical (Fig. 2, center). The compressive specimens were taken from the same locations as the tensile specimens.

Tensile and compressive yield stresses of each sample of extrusion were determined from load-strain diagrams obtained autographically.

Tests to determine the ultimate shear stress were made using specimens shown in Fig. 2 (bottom). Whenever possible, these specimens were taken from the same locations as the tensile specimens, except that tests of short-transverse specimens were made only on shapes 3 in., or more, in thickness. The tests were made with an Amsler double-shear tool in which the center 1-in. length was sheared from the 3-in. long specimen, the end thirds being supported throughout the length. In tests of longitudinal and long-transverse specimens, the loads were applied in the direction normal to the major surface of the

shape from which the specimens were taken; in tests of short-transverse specimens the loads were applied in the direction of extrusion, parallel to the major surface of the shape.

Bearing tests were made in accordance with ASTM Method E238-64T using longitudinal and, where possible, long-transverse specimens, of the types shown in Fig. 3. Flatwise and edgewise specimens were tested from shapes of suitable size. Edgewise specimens from shapes less than 1-1/2 in. in thickness, however, were 1 in. wide (Type A, Fig. 3). The bearing ultimate stresses and yield stresses were determined at edge distances of 1.5 and 2.0 times the pin diameter. The yield stress was determined as the stress at a permanent deformation of 2 per cent of the pin diameter, as indicated on autographic load-deformation diagrams. Before making these tests, the test fixtures and specimens were cleaned ultrasonically in suitable nontoxic solvent (Toson 3, Grannini Controls Corp.).

Certain lots were chosen for tensile and compressive modulus and stress-strain tests, fatigue and fracture-toughness tests. Samples from which both longitudinal and long-transverse specimens could be obtained were selected for these tests. In a few instances, however, the geometry of the shapes in certain thickness ranges permitted only longitudinal tests.

The tensile and compressive specimens used for modulus and stress-strain tests are shown in Figs. 4 and 5, respectively. In all modulus tests of longitudinal tensile specimens, and a few long-transverse specimens, strains were measured over a 6-in. gage length with an Amsler-Martens mirror-type extensometer (probably ASTM Class A). In most of the tests of long-transverse

tensile specimens it was necessary to use smaller specimens and measure strains over a 4 or 2-in. gage length with the Amsler-Martens mirror-type extensometer (ASTM Class B-1) or 1-in. gage length with the Tuckerman optical strain gage (ASTM Class A). In tests to determine modulus, the 6- or 4-in. gage length was used and the specimens were stressed up to about the proportional limit; then after removal of the load and starting again at zero stress and strain, strains were measured with the same instrument over a 2-in. gage length until the yield stress was exceeded. When strains were measured over a 2- or 1-in. gage length, tests were continued beyond the proportional limit to obtain the yield stress. In some tests of each alloy and temper, strains were measured beyond the yield stress to the ultimate stress with a 2-in. dial gage (each division = 0.001 in.) or scale and dividers to obtain complete tensile stress-strain curves. In all compressive modulus and stress-strain tests, the Tuckerman optical strain gage was used over a 2 or 1-in. gage length (ASTM Class A). For determination of each modulus value, the data were examined by the strain-deviation procedure in ASTM Method E111-61. Based on the various tests, representative typical and minimum stress-strain and tangent-modulus curves will be developed in accordance with the procedures as outlined in Section 3.2.3, 3.2.5 and 3.2.6 of Technical Report AFML-TR-66-386.\*

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\* D. P. Moon and W. S. Hyler, "MIL-HDBK-5 Guidelines for Presentation of Data", Technical Report AFML-TR-66-386, February, 1967.

Axial-stress fatigue tests were made using three longitudinal and three long-transverse specimens of the type shown in Fig. 6. They were tested at three stress levels ( $R=0.0$ ) in Krouse fatigue machines operating at 2400 rpm.

Fracture-toughness tests were made in accordance with the methods described in ASTM STP 411\* on fatigue-cracked single-edge-notched tensile specimens from the longitudinal and long-transverse directions. The types of specimens are shown in Fig. 7; the proportions of these specimens are the same as those of specimens used by NASA, Lewis Research Center. The fracture parameters were calculated from relationships developed from the NASA calibration.

Candidate values of the critical plane-strain stress-intensity factor,  $K_Q$ , were calculated using two values of load from the fracture-toughness tests. The first value was calculated using the load at the initial burst of unstable crack growth, as indicated by the initial significant deviation from linearity in the load-deformation curve. These values were obtained from load-deformation curves developed with SR-4 electrical-resistance strain-gage units, mounted as shown in Fig. 2 of the First Quarterly Report, dated June 15, 1966. In reporting the data, the degree of clarity of the initial deviation has been indicated by the use of the letter "P" to indicate a clear instability or pop-in, the letter "I" to

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\* W. F. Brown and J. E. Srawley, "Plane Strain Fracture Toughness Testing of High Strength Metals", ASTM STP 411, February, 1967.

indicate a less pronounced but yet abrupt initial deviation from linearity which is believed to be a suppressed pop-in, and "M" to indicate that the initial deviation was at the maximum or fracture load. The second value was calculated using the load at a 5 per cent secant offset, equivalent to about 2 per cent of crack extension; this was done as a result of recent recommendations of ASTM Committee E-24\* that the secant-offset method be considered for establishing  $K_Q$ .

Before values of  $K_Q$  can be accepted as values of  $K_{Ic}$ , they must meet two criteria:

- (a) the plastic zone size must be small with respect to the thickness, as indicated by the limitation that the thickness of the test specimen must be equal to or greater than 2.5 times the ratio  $(K_Q/\sigma_{YS})^2$ , and
- (b) any deviation from linearity in the load-deformation curve prior to the load used for the  $K_Q$  calculation must primarily represent crack extension, as indicated by the limitation on the load-deformation diagram that the horizontal displacement of the load-deformation curve (from the initial slope) at a load 80 per cent of that at the 5 per cent secant-offset intercept shall not be more than 1/4 of the displacement at the 5 per cent secant-offset intercept.

Values of the ratio  $(K_Q/\sigma_{YS})^2$  needed to check the thickness criterion above (a) are reported with the data. Conformance

\* "Draft Recommended Practice for Notch-Bend Fracture-Toughness Testing", ASTM Committee E24, February, 1967.

8.

with the deviation criterion (b) is still being evaluated and will be reported later, along with the final analysis to determine which values of  $K_Q$  may be considered acceptable values of  $K_{Ic}$ .

Resistance to Stress Corrosion

Stress-corrosion tests have been, or are currently being conducted, with specimens from 31 samples in the TX51X-type temper, and 12 samples in the "heat-treated-by-user" tempers.

Resistance to stress-corrosion cracking is determined with two types of specimens; longitudinal and long-transverse 0.125-inch diam tensile specimens (Fig. 8) are taken at the center line of the section thickness in all instances. For sections 0.750 inches or more in thickness short-transverse C-ring specimens (Fig. 9) are also taken, again on the center line. The tensile specimens are stressed in frames as indicated in Fig. 10 of this report, and Fig. 7 of the First Quarterly Report, dated June 15, 1966, while the C-rings are stressed in bending as shown in Fig. 8 of the First Quarterly Report; the stresses are 75 per cent of the actual tensile yield stress.

The stress-corrosion evaluations are conducted by alternate immersion in a 3.5% (by weight) NaCl solution (Sterling Granulated Salt in New Kensington tap water). The test cycle includes total immersion of the specimens for 10 min. per hour and aeration above the solution for the remaining 50 minutes per hour. The test cycle is repeated 24 times daily for a 12-week period. The test equipment, shown in Fig. 9 of the First

Quarterly Report, consists of large stationary aluminum alloy tanks which contain the salt solution, and a mechanism for raising and lowering the specimens to provide the desired cycle.

Selected tensile specimen failures are examined to verify the cause as stress-corrosion cracking, and all tensile specimens that do not fracture during exposure are tested in tension to determine the loss in tensile strength cause by corrosion.

The criteria for classifying C-ring specimens as failures are as follows:

- (a) in susceptible alloy-temper combinations, cracking in C-rings is usually well defined and readily visible at a macroscopic level (magnifications up to 10 diameters). With such alloys and tempers visual examination is sufficient and any crack readily detected at 10X magnification is considered cause for removal from test. For such combinations metallographic examination to verify the cause of failure as stress-corrosion cracking, has therefore been limited to a few representative failures.
- (b) In alloy and temper combinations developed to provide a high degree of resistance to stress-corrosion cracking, C-ring failures, when they do occur, usually develop as very fine, short cracks which are not readily detected visually.

Consequently, all C-rings of such alloy and tempers are examined metallographically after completion of the 84-day exposure period. Any evidence of stress-corrosion cracking results in the specimen being classified as a failure.

The stress-corrosion test results will be compared with existing data for aluminum alloy extruded sections to ascertain that performance was typical of that expected for the various alloy systems.

#### IV. Summary.

The results of tensile, compressive, shear and bearing tests of 125 samples of extrusions in the TX51X temper are shown in Tables II through IX; the corresponding properties for 28 extrusions in the "heat-treated-by-user" tempers are shown in Table X. The tensile properties of all samples exceed the values in applicable Federal Specifications. Specified minimum tensile properties for extrusions are shown in Table XI; the values shown in this table are those published in "Standards for Aluminum Mill Products", The Aluminum Association, 1967. Some of these values, as indicated in the table, are lower than those shown presently in Federal Specifications. It is understood, however, that the values in "SAMP" will be in the next revisions of the Federal Specifications.

The ratios among the tensile, compressive and shear properties of the extrusions in the TX51X tempers are shown in Tables XII through XIX and those for the "heat-treated-by-user"

11.

tempers are shown in Table XX. The ratios among the bearing and tensile properties of the corresponding extrusions are shown in Tables XXI through XXVIII and XXIX, respectively. The ratios among the properties at different locations with regard to width and thickness are shown in Table XXX. The ratios among bearing properties obtained using edgewise specimens to those obtained using flatwise specimens are shown in Table XXXI.

The results of the axial-stress fatigue tests are shown in Figs. 11 through 16, and those of the fracture-toughness tests for the extrusions in the TX51X tempers and "heat-treated-by-user" tempers are shown in Tables XXXII and XXXIII, respectively.

The current status of the stress-corrosion tests is shown in Table XXXIV for the extrusions in the TX51X tempers and Table XXXV for the extrusion in the "heat-treated-by-user" tempers. The tests results continue to indicate typical performances for the various materials.

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V. Tables and Figures.

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Table 3; all others from Prostean A

**TABLE II**  
**MATERIAL PROPERTIES OF STRESS-INSENSITIVE STRENGTHENED 2014-T6510 ALUMINUM ALLOY EXTRUSIONS**  
 [AF33(615)-3580]

Section Number	Gross Area, in. <sup>2</sup>	Lod- tions Number	Dir- ection of test	Tensile Ultimate Stress, psi		Elongation at Break, in.	Comp. Yield Stress, psi	Sear Ultimate Stress, psi	Ultimate Yield Stress, psi		Ultimate Stress, psi	Yield Stress, psi
				Tensile Yield Stress, psi	2 in. or 1 in. psi				6751.5	6752.0		
0.061	0.30	317950	T/2	67	100	62	200	9.0	64	60	—	—
0.070	0.24	3180178	7/2	74	700	68	600	5.0*	62	80	—	—
0.073	0.18	317951	7/2	62	800	61	900	9.5	52	90	—	—
0.246	0.45	318130*	2/2	62	100	59	100	11.5	61	800	44	300
0.250	3.7	302154	7/2	64	100	60	400	10.0	60	400	46	400
0.271	0.40	317994	T/2	75	500	62	900	12.5	63	800	69	300
0.625	0.50	317952	7/2	71	700	67	900	13.5	63	400	47	200
0.625	0.55	302691	T/2	71	500	65	900	14.3	60	300	—	—
0.750	1.4	317924	7/2	76	700	71	100	11.5	73	100	42	800
1.657	2.2	318046	D/2	70	300	63	500	7.8	68	400	41	500
			D/2	72	600	68	100	10.5	67	800	104	800
			D/2	73	200	66	500	10.5	68	200	132	500
			D/2	67	400	60	200	7.8	—	—	99	700

\* T - Thickness; V - Width, D - Diameter;  
 1 - Longitudinal; LR - Long-transverse;  
 Offset equals 0.2 per cent  
 Producer B: all others from Producer A

\*\* Specimens and fixtures cleaned ultrasonically in Rosen 3 solvent  
 TT Offset equals 2 per cent of pin diameter  
 §§ Sub-size sheet-type specimen; 1/8-in. wide; 1/2-in. gap length

**TABLE III**

**Mechanical Properties of Stress-Relieved Stretched P90-P9510 Aluminum Alloy Extrusions  
(AP33(6151-3560))**

\* T - Telephone; W - Watch

• Offset equals 0.2 per cent

6 Producer B; all others from Producer A

Specimens and Pictures cleaned ultrasonically in Tissue 3 solvent.

Correct example 2 for some of min diameter

**44** Average of two tests; all cultures, single tests.

Sub-einechidnia-type specimen; 1/8-in. wide; 1-in. long.

Sub-size chisel-type specimen; 1/8-in. wide; 1-in. gauge length.

• Samples were in the T3511 category.

TABLE IV

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRENGTHENED 2024-T351 ALUMINUM ALLOY EXTRUSIONS  
[AP33(615)-35CQ]

Section Number	Sample Number	Sectional Area, in. <sup>2</sup>	Loca- tion <sup>a</sup>	Direc- tion <sup>b</sup>	Tensile			Tensile			Elongation			Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Tensile			Tensile			Ultimate Stress, psi	Yield Stress, psi	Tensile							
					Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.	Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.	Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.			Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.	Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.			Ultimate Stress, psi	Yield Stress, psi	Offset Elong., in.					
0.075	0.70	318084	T/2	L	78 400	66 300	6.0	70 000	—	—	110 200	141 400	98 500	111 600	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.094	0.30	318114	T/2	L	77 500	66 600	3.0***	73 300	—	—	102 000	139 500	100 000	115 000	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.103	0.33	317883	T/2	L	73 200	66 800	6.0	73 200	—	—	107 000	141 300	98 500	112 600	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.108	0.31	317883	T/2	L	78 200	66 800	6.0	70 000	—	—	107 000	141 300	97 500	110 600	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.120	0.37	318024	T/2	L	71 200	66 800	6.0	70 000	—	—	107 000	141 300	97 500	110 600	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.151	0.62	317883	T/2	L	73 200	70 130	5.0****	69 600	—	—	111 200	141 400	101 200	117 500	—	—	—	—	—	—	—	—	—	—	—	—	—				
0.195	2.0	317894	T/2	L	71 500	70 200	6.5	75 500	44 200	10.9****	111 100	141 600	99 400	117 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.298	4.2	318082	T/2	L	72 500	70 200	7.5	75 500	43 200	9.9****	118 200	141 500	99 500	114 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.375	0.66	317881	T/2	L	79 100	66 300	7.5	75 500	43 200	9.9****	109 700	141 400	98 500	114 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.510	10.1	317894	T/2, V/2	L	73 200	66 700	9.5	70 000	41 600	10.9****	106 200	141 600	96 000	110 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.525	1.9	318024	T/2, V/2	L	71 200	66 200	10.0	67 000	41 300	10.9****	106 500	141 300	91 600	100 500	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.550	1.9	317892	T/2, V/2	L	70 700	66 000	10.5	68 200	41 300	10.9****	106 600	141 600	94 800	111 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.602	5.0	317894	T/2, V/2	L	72 200	67 200	9.9	70 700	41 200	10.9****	103 700	141 800	98 600	112 500	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.815	3.9	3180418	T/2, V/2	L	73 200	67 200	10.5	68 200	41 200	10.9****	103 900	141 800	98 600	112 500	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
0.990	4.6	317893	T/2, V/2	L	72 200	68 200	11.5****	69 500	41 200	10.9****	106 200	141 600	93 500	109 300	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
1.150	5.6	318078	T/2, V/2	L	73 200	68 200	11.5****	67 700	41 200	10.9****	101 000	141 900	96 600	117 200	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
1.200	3.9	317893	T/2, V/2	L	71 200	68 200	12.0****	69 500	41 200	10.9****	106 300	141 500	97 500	117 400	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
1.450	7.3	3180056	T/2, V/2	L	75 200	67 200	12.0****	70 700	41 200	10.9****	106 600	141 500	95 700	112 900	101 300	130 700	91 200	115 100	101 300	131 700	91 700	111 200	—	—	—	—					
1.705	4.0	318069	T/2, V/2	L	73 200	68 200	12.0****	69 500	41 200	10.9****	106 800	141 100	99 500	109 300	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
2.360	8.8	3180607	T/2, V/2	L	71 200	68 200	12.0****	69 500	41 200	10.9****	106 000	141 200	98 500	109 300	97 700	111 400	98 100	105 300	—	—	—	—	—	—	—	—	—	—	—	—	—
2.760	29.6	318079	T/2, V/2	L	75 200	68 200	12.0****	69 500	41 200	10.9****	106 800	141 100	99 500	109 300	107 300	124 300	98 600	106 300	107 300	124 300	98 600	106 300	98 600	106 300	98 600	106 300	98 600	106 300			
4.000	24.0	3180875	T/2, V/2	L	71 200	68 200	12.0****	69 500	41 200	10.9****	106 800	141 100	98 500	109 300	107 300	124 300	98 600	106 300	107 300	124 300	98 600	106 300	98 600	106 300	98 600	106 300	98 600	106 300			
6.300	30.7	318089	T/2, V/2	L	71 200	68 200	12.0****	69 500	41 200	10.9****	106 800	141 100	98 500	109 300	107 300	124 300	98 600	106 300	107 300	124 300	98 600	106 300	98 600	106 300	98 600	106 300	98 600	106 300			

<sup>a</sup> T - Transverse; W - Width.<sup>b</sup> L - Longitudinal; LF - Long-Transverse; SF - Short-Transverse.<sup>c</sup> Offset equals 0.2 per cent.<sup>d</sup> Producer B; all others from Producer A.<sup>e</sup> Specimens and fixtures cleaned ultrasonically in Tropo 3 solvent.<sup>f</sup> Offset equals 2 per cent of pin diameter.<sup>\*\*\*</sup> Bearing specimen failed before reaching yield stress (2 per cent offset).<sup>\*\*\*\*</sup> Sub-size sheet-type specimen; 1-in. wide; 1-in. gage length.<sup>\*\*\*\*\*</sup> Sub-size sheet-type specimen; 1/8-in. wide; 1/8-in. gage length.<sup>††††</sup> Sample was in the 70511 temper.

TABLE V

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 6061-T651 ALUMINUM ALLOY BIMETALIC RODS  
[AR33(615)-3580]

Specimen Number	Section Area, in. <sup>2</sup>	Section Inches: 1 in., 2 in., 3 in.	Loca- tion*	Dir- ection†	Tensile Properties		Bearing**		Ultimate Strain, per cent	Field Stress, psi	
					Ultimate Tensile Strength, psi	Yield Strength, psi	Ultimate Shear Strength, psi	Ultimate Shear Strength, psi			
0.050	0.42	3181564	2 1/2	L	45,000	42,400	21,0	41,500	—	79,400	107,300
0.075	0.59	317857	2 1/2	L	45,800	37,200	13,0	40,100	—	79,200	91,700
0.090	0.37	3180274	2 1/2	L	44,700	42,100	13,0 <sup>++</sup>	42,200	—	65,100	152,200
0.125	0.61	317857	2 1/2	L	42,200	39,700	11,5 <sup>++</sup>	38,600	—	77,600	163,500
0.126	0.30	317847	2 1/2	L	42,900	39,700	10,5 <sup>++</sup>	39,800	31,400	70,900	90,700
0.245	1.1	3404224	2 1/2	L	42,300	41,600	17,0	40,700	23,200	77,500	103,900
0.250	0.36	317848	2 1/2	L	45,800	39,900	12,0	44,500	33,800	—	—
0.254	0.97	3404224	2 1/2	L	45,800	38,600	12,0	42,800	30,500	78,600	102,800
0.310	6.3	317905	2 1/2	L	47,700	42,900	16,5	46,500	31,100	79,500	101,700
0.315	5.8	317953	2 1/2	L	49,100	43,200	16,5 <sup>++</sup>	42,300	31,100	70,700	103,400
0.375	9.6	317927	2 1/2	L	44,500	43,200	18,5	40,100	34,400	78,000	102,600
0.375	7.7	318083	2 1/2	L	45,900	42,600	18,5	42,000	32,600	80,000	103,100
0.918	1.7	317906	7 1/2, X/2	L	42,600	42,600	16,0	42,500	36,100	80,600	103,700
1.004	2.0	3404224	7 1/2, X/2	L	40,800	41,800	20,0 <sup>++</sup>	41,700	35,800	81,000	101,400
1.240	2.7	317907	7 1/2, X/2	L	42,200	42,200	19,5	42,500	31,600	75,200	—
1.360	4.4	317896	7 1/2, X/2	L	46,800	46,800	18,5	46,800	29,100	80,000	101,400
3.000	15.0	340226	7 1/2, X/2	L	52,200	47,200	17,0	43,000	27,800	62,200	73,200
6.500	35.2	317857	D/A	L	52,900	49,900	16,0	48,700	27,500	61,800	73,700
			D/2	L	52,600	46,100	15,0	45,500	26,900	75,600	72,400
			D/2	L	51,600	49,100	13,0	44,700	26,700	62,000	71,300
			D/2	L	51,600	46,100	12,5	46,000	27,000	69,300	72,000
			D/2	L	51,600	47,700	12,5	45,600	26,600	65,500	67,500
			D/2	L	51,600	47,700	12,5	46,600	26,600	—	—

\* L - Width; W - Width; D - Diameter  
† L - Longitudinal; LR - Long-transverse; ST - Short-transverse  
‡ Offset equals 0.2 per cent.  
§ Specimens 1/2 in. wide.

\*\* Specimens and Pictures cleaned ultrasonically in Tsoen 3 solvent.

†† Offset equals 2 per cent of pin diameter.

††† Sample sheet-type specimen: 1/2-in. wide, 1-in. gauge length.

TABLE VI

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRUTCHED 7075-T6510 ALUMINUM ALLOY RIVETINGS  
[AP33(015)-160]

Section- Thickness, in.	Cross- Sectional Area, in. <sup>2</sup>	Number	Loca- tion <sup>†</sup>	Direc- tion <sup>‡</sup>	Tensile Ultimate Stress, psi	Tensile Yield Stress, psi	Elongation in. in. or 40. %	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Type			Direction <sup>§</sup>			
										Ultimate Stress, psi			Yield Stress, psi			
										6/61.5°/D-7.0	6/61.5°/D-7.0	6/61.5°/D-7.0	6/61.5°/D-7.0	6/61.5°/D-7.0	6/61.5°/D-7.0	
0.055	0.18	317899	T/2	L	67,000	74,200	11.0	75,400	..	126,600	158,400	106,300	123,100	..	..	..
0.055	0.27	318034	T/2	LF	64,200	71,200	10.5	77,400	..	125,900	158,700	102,400	125,400	..	..	..
0.060	0.18	317858	T/2	L	68,200	74,400	12.0 <sup>**</sup>	60,500	..	125,500	159,900	109,600	124,900	..	..	..
0.133	0.97	318029	T/2	LF	68,200	81,300	12.0	76,600	..	124,600	156,200	107,000	123,900	..	..	..
0.160	0.26	318030	T/2	L	67,500	79,300	12.0	82,800	..	126,500	158,100	108,600	128,600	..	..	..
0.209	1.2	318040	T/2	LF	69,700	82,200	11.0 <sup>**</sup>	90,800	68,400	131,800	156,900	106,800	124,800	..	..	..
0.260	1.2	318028	T/2	L	62,500	71,200	11.5	76,800	68,500	126,100	158,000	104,800	123,400	..	..	..
0.313	0.51	317908	T/2	LF	62,800	74,200	12.0 <sup>**</sup>	65,200	61,400	122,900	156,200	101,100	119,400	123,700	151,700	103,190,196,800
0.355	2.4	318037	T/2	LF	62,800	76,200	12.0	81,200	65,700	125,000	160,600	104,400	126,600	..	..	..
0.375	2.2	317954	T/2	LF	63,800	80,300	11.6	82,200	67,100	129,100	160,200	113,000	126,500	..	..	..
0.438	7.2	317899	T/2	LF	67,600	80,300	12.0	80,400	69,900	121,000	152,100	112,200	124,200	..	..	..
0.463	1.9	318033	T/2	LF	67,600	77,700	12.0	78,800	68,100	121,900	155,400	99,400	119,800	..	..	..
0.505	7.2	340155	T/2,V/4	L	68,300	81,700	11.5	80,400	67,500	127,400	161,200	109,500	127,500	..	..	..
			T/2,V/2	LF	68,400	76,100	12.0	77,100	67,900	129,900	157,400	107,600	131,600	..	..	..
1.023	1.8	318074	T/2,V/4	LF	62,800	75,200	12.0	79,400	65,500	125,900	158,100	108,100	123,100	..	..	..
1.108	27.1	317860	T/2,V/4	LF	62,800	82,200	9.0	79,500	61,100	126,900	159,400	108,600	126,600	108,800	148,100	26,100,117,200
			T/2,V/2	LF	62,800	79,300	13.0	81,600	67,900	129,000	158,500	111,500	126,600	112,800	142,900	92,700,120,700
			T/2,V/2	LF	62,800	78,600	12.0	73,100	66,200	125,500	155,500	107,600	119,400	110,800	147,100	160,600,119,700
1.500	1.8	317955	D/2	LF	93,600	86,700	9.5	88,000	67,200	126,000	159,800	110,800	127,600	115,800	148,400	97,500,117,700
2.000	3.1	317861	D/2	LF	77,100	82,700	6.2	86,800	69,200	127,300	164,500	103,000	128,400	..	..	..
			D/2	LF	79,100	82,700	10.0	75,100	67,700	128,700	155,700	103,500	122,900	..	..	..
2.190	17.0	318137	T/2,V/4	LF	65,800	76,800	10.6	75,400	66,300	120,600	151,400	105,000	125,000	103,200	139,200	98,800,121,700
			T/2,V/2	LF	61,700	75,200	16.6	72,400	65,200	117,900	149,100	106,500	124,600	112,800	132,600	98,800,120,600
			T/2,V/2	LF	77,100	80,800	9.0	73,000	63,100	120,500	152,200	103,800	121,900	101,900	135,300	94,800,115,600
2.750	8.2	340104	T/2,V/4	LF	70,200	92,200	11.6	72,800	68,400	122,900	156,200	103,100	122,900	123,900	155,100	105,100,122,900
			T/2,V/2	LF	69,300	85,200	11.0	82,800	67,200	121,800	157,100	100,500	120,000	120,700	154,200	102,300,118,600
			T/2,V/2	LF	78,300	85,200	9.0	74,200	66,500	..	..	..	..	..	..	..
3.040	13.8	318138	T/2,V/4	L	86,700	79,100	10.4	86,700	66,200	120,100	152,000	106,500	124,300	115,200	146,100	103,400,122,900
			T/2,V/2	LF	84,800	87,300	7.0	73,500	64,100	118,500	149,400	101,800	126,300	115,300	145,200	101,600,118,700
			T/2,V/2	LF	73,500	86,700	9.5	77,800	65,200	..	..	..	..	..	..	..
3.090	24.3	340391	T/2,V/4	L	87,600	78,200	11.3	79,000	67,000	125,100	159,400	102,900	130,700	111,600	148,000	98,000,118,600
			T/2,V/2	LF	84,200	78,200	10.6	76,800	64,700	117,800	152,800	97,100	118,600	111,700	147,200	98,000,118,600
			T/2,V/2	LF	77,800	88,600	9.3	73,800	63,500	118,000	151,200	95,700	113,100	104,700	135,600	91,500,112,500
			T/2,V/2	LF	75,000	88,600	8.0	71,800	62,500	..	..	..	..	..	..	..

<sup>†</sup> T - Thickness; W - Width; D - Diameter<sup>‡</sup> L - Longitudinal; LF - Long-Transverse

Offset equals 0.2 per cent

# Producer B; all others from Producer A

<sup>\*\*</sup> Specimens and Fixtures cleaned ultrasonically in Teon 3 solvent.<sup>††</sup> Offset equals 2 per cent of pin diameter.<sup>‡‡</sup> Subsize sheet-type specimen; 1/2-in. wide, 1/2-in. gauge length.<sup>¶¶</sup> Subsize sheet-type specimen; 1/4-in. wide, 1-in. gauge length.

**TABLE VII**  
**Mechanical Properties of Stress-Relieved Stretched 7075-T7350 Aluminum Alloy Extrusions**  
 AFSS(615)-3580

Section Thickness, In. <sup>1</sup>	Gross Sectional Area, In. <sup>2</sup>	Specimen Number	Diameter, In. <sup>3</sup>	Tensile Ultimate Stress, psi	Tensile Yield Stress, psi	Elongation in. or %D, in.	Bend <sup>4</sup>	Ultimate Tensile Strength, psi		Shear Ultimate Strength, psi		Ultimate Stress, psi	
								Specimen Type	Comp. Stress, psi	Specimen Type	Comp. Stress, psi	Specimen Type	Comp. Stress, psi
0.08 <sup>5</sup>	0.18	317862	7/2	79,400	71,100	9.0	7/2	300	42,500	120,600	103,200	120,200	--
0.12 <sup>6</sup>	1.2	340395	7/2	75,200	64,100	12.0*8	75,200	900	41,000	109,400	139,200	89,100	107,200
0.312	0.52 <sup>7</sup>	317909	7/2	76,300	66,200	11.5	69,400	44,200	109,100	141,200	89,200	104,100	--
0.325	0.52	340398	7/2	73,200	61,300	12.5	65,200	39,400	109,100	141,200	88,600	106,500	--
0.375	2.2	317930	7/2	74,700	68,700	11.5	65,800	42,700	115,400	146,300	92,300	109,400	--
0.438	7.2	317930	7/2	72,500	68,200	11.0	68,800	42,800	118,100	152,800	98,900	117,200	--
0.935	7.2	340292	7/2, V/4	72,200	70,300	12.5	71,800	44,100	118,800	152,600	97,600	120,000	--
1.000	5.7	340293	7/2, V/4	73,200	68,600	12.5	70,600	44,600	116,300	149,400	96,400	114,200	--
1.500	1.9	317956	D/2	73,700	67,700	12.5	71,400	43,700	115,100	144,000	97,200	113,600	--
2.000	3.1	317948	D/4	71,800	61,600	6.2	68,800	43,800	116,600	149,100	96,400	113,600	--
2.750	8.2	340440	T/2, V/4	77,800	70,200	12.5	69,900	44,900	112,200	146,200	99,900	107,200	105,900
				70,200	69,500	12.6	66,100	42,100	114,300	147,500	97,900	111,100	103,500
				71,500	68,600	12.5	64,600	43,700	110,200	143,500	88,100	103,900	107,500
				72,700	68,500	11.5	63,600	41,700	111,100	145,700	93,800	111,500	--
				73,800	61,600	6.2	72,800	44,200	111,400	146,000	90,700	109,400	--
				77,800	70,200	12.5	71,400	45,600	112,200	145,800	92,300	109,400	--
				77,700	68,500	12.5	65,200	43,900	110,200	144,000	89,300	107,800	109,700
				77,700	68,500	12.5	65,200	43,900	107,600	138,900	86,200	105,700	109,600
				77,700	68,500	12.5	65,200	43,900	107,600	138,900	86,200	105,700	109,600
				77,700	68,500	9.0	62,600	41,200	109,700	141,200	88,800	105,900	--
				77,700	68,500	8.0	62,600	41,200	109,700	141,200	88,800	105,900	--

\* T = Thickness; W = Width; D = Diameter  
 + L = Longitudinal; LF = Long Transverse  
 \* Offset equals 0.2 per cent.  
 \*\* Specimens and Pictures cleaned ultrasonically in Teson 3 solvent.  
 \*\* Offset equals 2 per cent of pin diameter.  
 Subsize sheet-type specimen; 1/4-in. ride; 1-in. gage length

**TABLE VIII**  
**MECHANICAL PROPERTIES OF STRESS-STRENGTHENED STRETCHED 7079-T6510 ALUMINUM ALLOY EXTRUSIONS**  
 [AR33(615)-3580]

Section Thickness, in.	Section Area, in. <sup>2</sup>	Number	Loca- tion <sup>1</sup>	Direct- tional <sup>2</sup>	Tensile Ultimate Stress, psi	Tensile Field Stress, psi	Elongation in. or in. %	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Bearing <sup>3</sup>	
										Ultimate Stress, psi	Field Stress, psi
0.080	0.25	340005	2/2	L	84,200	77,600	10.5	76,600	—	123,100	156,200
0.146	1.1	340006	2/2	L	85,200	77,700	10.0	76,600	—	124,800	156,100
0.162	0.72	340052	2/2	L	85,800	75,700	12.0 <sup>44</sup>	82,200	—	126,800	157,400
0.251	0.82	340053	2/2	L	86,400	75,100	10.5	78,400	—	124,400	156,500
0.500	4.2	340024	2/2,V/4	L	84,100	75,100	16.0 <sup>44</sup>	64,200	—	—	—
					85,700	78,900	12.0	79,700	48,400	125,100	156,100
					87,000	72,600	14.1	79,600	47,500	—	—
					87,600	72,600	14.1	79,600	—	—	—
					87,200	75,600	13.0	75,700	45,000	118,800	156,600
					79,500	73,000	15.0	78,300	44,000	118,900	151,100
					82,400	74,500	14.0	75,200	45,200	118,800	148,900
					80,700	71,500	19.0 <sup>44</sup>	77,400	44,500	—	—

<sup>1</sup> F - flat classes; V - With  
<sup>2</sup> L - longitudinal; LF - Long-transverse  
<sup>3</sup> Offset equals 0.2 per cent.

<sup>4</sup> Producer B; all others from Producer A

<sup>44</sup> Specimens and fixtures cleaned ultrasonically in Toluca 3 solvent.

<sup>444</sup> Offset equals 2 per cent of pin diameter.

<sup>4444</sup> Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. long.

<sup>44444</sup> Subsize sheet-type specimen; 1/4-in. wide; 1-in. long.

**TABLE II**  
**MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 7178-T6510 ALUMINUM ALLOY EXTRUSIONS**  
[AFR3(615)-3580]

Section Cross- Sec- tion: In. in. in.	Sample Number	Loca- tion*	Dir- ec- tion†	Tensile Ultimate Stress, psi	Elongation in. or in.	Coop. Yield Stress,* psi	Shear Ultimate Stress, psi	Bearing**		Bending***	
								Ultimate Stress, psi	Plastic Strain,	Ultimate Stress, psi	Plastic Strain,
0.063	0.37	317902	1/2	15	95 400	95 900	9.5 10.0***	90 400	—	123 500 168 900	117 400 138 900
0.066	0.25	340426#	1/2	15	90 200	87 500	9.0 12.0***	82 400	—	135 800 171 100	111 500 136 400
0.142	1.0	318016	1/2	15	90 300	89 500	9.5 14.0***	88 700	—	131 600 166 700	114 90 157 300
0.154	0.42	318035#	1/2	15	92 200	85 500	9.5 14.0***	92 300	—	138 300 172 600	120 300 138 500
0.152	0.49	317903	1/2	15	91 300	85 400	10.5 10.5	84 800	—	132 600 164 400	114 300 129 800
0.162	1.1	340424#	1/2	15	92 300	85 500	9.5 10.5	78 800	—	130 600 161 400	110 200 128 700
0.180	1.6	340295	1/2	15	92 200	85 500	9.0 10.0***	84 700	—	131 800 165 500	118 300 129 800
							85 600	—	—	140 700 164 600	122 300 145 600
0.261	0.60	340427#	1/2	15	95 700	86 200	10.0 12.0	88 700	52 200	135 100 170 900	110 600 129 400
0.265	0.88	317936	1/2	15	95 400	89 400	10.0	89 200	51 800	132 600 166 600	112 700 125 600
0.625	6.9	317997	1/2, 1/4	15	95 600	86 900	10.7	85 500	51 800	133 400 164 800	114 300 134 900
							91 000	—	—	132 400 162 200	113 600 129 500
0.780	1.7	340254	1/2, 1/4	15	95 600	89 400	10.7	88 500	51 800	131 000 166 500	113 600 129 500
1.200	3.9	318135#	1/2, 1/4	15	95 600	88 900	10.7	87 500	50 600	137 200 171 500	110 800 135 100
							91 000	—	—	132 300 166 700	113 900 137 700
1.438	6.4	317957	1/2	15	95 200	87 500	9.5	88 900	50 700	132 200 166 300	111 400 139 300
							96 400	—	—	149 500	122 400 159 200
							97 200	—	—	52 500	—
							—	—	—	—	—
2.180	15.5	318140#	1/4, 1/4	15	91 100	85 300	8.0	83 700	49 100	124 400 161 700	111 600 134 300
							82 600	—	—	46 600	122 400 159 400
							83 600	—	—	80 100	110 700 129 500
							82 400	—	—	46 600	108 800 144 600
							76 600	—	—	123 800 157 600	102 100 140 600
							77 300	—	—	—	—

\* I - Width; H - Height  
† L - Longitudinal; LF - Long-transverse; ST - Short-transverse  
‡ Offset equals 0.2 per cent of min diameter.  
# Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gauge length  
Producer A

\*\* Specimens and Figures cleaned ultrasonically in Tern 3 solvent.  
†† Offset equals 2 per cent of min diameter.  
# Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gauge length

TABLE I  
MECHANICAL PROPERTIES OF EXTRUSIONS IN THE "HEAT-TREATED-BY-TEAR" TEMPER  
AP21(61)-2380

Alloy and Temper	Sample Number	Section Cross- Sectional Area, in. <sup>2</sup>	Thick- ness, in.	Loca- tion	Dir- ection	Tensile Tensile Elongation Ultimate Stress, psi Yield Stress, psi	In 2 in. or 4D, in.	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Ultimate Tensile		Yield Stress,† psi	Ultimate Stress,‡ psi	Yield Stress,§ psi	Ultimate Stress,   psi	
										Stress, psi	Strain, in./in.					
2024-T42	C-185	1.0	3402006	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.350	.5.3	318084	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.499	1.4	318085	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.664	0.27	318088	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.883	0.27	318086	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.430	2.1	3402416	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.500	0.64	340243	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	2.562	€.4	340245	T/4, W/4	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
			T/2,W/2	ST	ST	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	2024-T52	0.664	0.27	318C-95	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --
	0.883	0.27	318087	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.430	2.1	3402426	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	0.500	0.64	340244	T/2	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
	2.562	5.4	340246	T/4, W/4	L	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	
			T/2,W/2	ST	ST	68 500 71 700 74 200 74 700 71 700 70 300	62 800 63 900 63 200 63 400 63 100 63 800	11.5 9.5 12.5 12.0 10.2	67 900 68 700 70 100 72 600 69 100 67 300	-- -- 43 100 41 400 41 300 -- -- --	109 200 141 200 112 200 112 500 110 200 103 800	94 400 112 000 115 100 115 600 110 100 123 100	-- -- -- -- -- 75 300	-- -- -- -- -- 86 900	-- -- -- -- -- --	

\* T - Thickness; W - Width  
 † L - Longitudinal; ST - Short-Transverse  
 § Offset equals C.2 per cent  
 \$ Producer B: All others from Producer A  
 \*\* Specimens and fixtures cleaned ultrasonically in Toson 3 solvent  
 ¶ Offset equals 2 per cent or pin diameter  
 §§ Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gauge length

Continued

TABLE X

TABLE X (Concluded)  
MECHANICAL PROPERTIES OF EXTRUSIONS IN THE "HEAT-TREATED-BY-USER" TEMPER  
AV35(615)-3580

Alloy and Temper	Section Cross- Sectional Area, in. <sup>2</sup>	Sample Number	Loca- tion:	Direc- tion:	Tensile Tensile Ultimate Yield Stress, Stress, ; psi psi	Biaxial In 2 in. or 4 in. psi	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Plastic		Bearing**	Elongation
									Ultimate Stress, psi	Yield Stress, psi		
									Offset 2.0	Offset 2.0		
6061-T62	0.246	4.6	318090	T/2	150000	150000	155	45100	80000	69400	80500	--
	1.625	3.9	418091	T/4, V/4	46100	41100	185	40000	82400	73800	85400	--
			318093	T/2	45000	45000	140	42500	75900	67500	77700	--
			318094	T/2	45000	45000	190	43700	76200	69200	76700	74600
			318095	T/2	45000	45000	150	43200	76200	69200	76700	74500
7075-T62	0.063	0.34	318094	T/2	80700	70500	110	74900	--	118000	152200	96900
	0.126	0.17	318092	T/2	79200	70000	130*	76700	--	--	--	--
	0.300	1.7	318093	T/2	91300	85200	130	85900	48700	124000	158500	106600
	1.225	21.2	318093	T/2, V/4	87100	78000	105	81800	48600	124900	153200	110200
			318095	T/2	87100	78000	105	81800	48500	124900	153200	110200
			318100	D <sup>4</sup>	80800	75100	115	78500	47500	124900	156800	107900
	2.250	4.1	318100	D <sup>2</sup>	92700	85100	105	85600	48800	122200	152800	108500
			318095	T/2	76700	66100	78	72400	46300	120300	151300	103120
7075-T73	0.063	0.34	318095	T/2	71300	61300	105	63100	--	106800	139100	87000
	0.126	0.17	318093	T/2	67800	58600	110	66800	--	--	--	--
	0.300	1.7	318097	T/2	75300	65300	117	71800	43700	122700	145500	93200
	1.225	21.2	318099	T/2, V/4	73400	65800	105	77500	42200	113100	148600	98900
			318101	D <sup>4</sup>	73600	65800	105	77500	43300	114200	144900	98900
	2.250	4.1	318101	D <sup>2</sup>	79800	72700	115	72800	42400	118800	150600	108150
			318095	T/2	75100	67300	110	71900	42900	119900	142400	93800
7278-T62	0.050	0.15	340247	T/2	96700	88600	115	91200	--	135400	166100	117300
	0.051	0.20	318102	T/2	95800	88100	105*	97700	--	138400	167900	125900
	0.403	3.0	340249	T/2	93400	89700	7.5	92800	51900	134100	167900	126400
			318095	T/2	93200	85100	105	97800	50300	141500	164800	120800

\* T - Thickness; W - Width; D - Diameter  
† L - Longitudinal; LT - Long-transverse; ST - Short-transverse

‡ Offset equals 0.2 per cent

§ Producer A: all others from Producer A

¶ Specimens and Pictures cleaned ultrasonically in Tosen 3 solvent

\*\* Offset equals 2 per cent of true diameter

†† Subsize sheet-type specimen; 1/2-in. wide; 1-in. gauge length

\*\*\* Subsize sheet-type specimen; 1/2-in. wide; 1-in. gauge length

(concluded)

TABLE X (Concluded)

TABLE XI

SPECIFIED MINIMUM VALUES\* FOR ALUMINUM ALLOY EXTRUSIONS  
[AF33(615)-3580]

Alloy and Temper	Thickness, in.	Area, sq. in.	Tensile			Federal Specification
			Ultimate Stress, psi	Yield Stress, † psi	Elongation 2 in. or 4D, %	
2014-T62	≤0.749	A11	60 000	53 000	7	
-T6510	≤0.499 0.500-0.749 ≥0.750	A11 A11 ≤25	60 000 64 000 68 000	53 000 58 000 60 000	7 7 7	
2024-T3510, -T3511	≤0.249 0.250-0.749 0.750-1.499 ≥1.500 ≥1.500	A11 A11 A11 ≤25 ≥25, ≤32	57 000 60 000 65 000 70 000 68 000	42 000 44 000 46 000 52 000 48 000	12 12 10 10 8	QQ-A-200/3b
-T42	≤0.749 ≥1.500	A11 ≤25	57 000 57 000	38 000 38 000	12 10	
-T8510, -T8511	0.050-0.249 0.250-1.499 ≥1.500	A11 A11 ≤32	64 000 66 000 66 000	56 000 58 000 58 000	4 5 5	
-T62	≤0.749 ≥1.500	-	-- --	-- --	- -	None
6061-T62*, -T6510	≤0.249 ≥0.250	A11 A11	38 000 38 000	35 000 35 000	8** 10	QQ-A-200/8b
7075-T62*, -T6510	≤0.249 0.250-0.499 0.500-2.999 3.000-4.499 3.000-4.499 4.500-5.000	A11 A11 A11 ≤20 ≥20, ≤32 ≤32	78 000 81 000 81 000 81 000 78 000 78 000	70 000 73 000 72 000 71 000 70 000 68 000	7 7 7 7 6 6	QQ-A-200/11b
-T73X, †† -T73510	≤0.249 0.250-0.499 0.500-1.499 1.500-2.999 3.000-4.499 4.500-5.000	- - - - - -	-- -- -- -- -- --	-- -- -- -- -- --	- - - - - -	None
7079-T62*, -T6510	≤0.249 0.250-0.499 0.500-1.499	≤20 ≤20 ≤20	75 000 77 000 78 000	67 000 68 000 70 000	7 7 7	QQ-A-200/12b
7178-T62*	≤0.061 0.250-1.499	≤20 ≤20	79 000** 82 000**	73 000** 74 000**	5 5	QQ-A-200/13
-T6510	0.062-0.249 0.250-1.499 1.500-2.499	≤20 ≤25 ≤25	84 000** 87 000** 86 000	76 000** 78 000** 77 000**	5 5 5	

\* All values are as shown in the Aluminum Association Booklet, "Standards for Aluminum Mill Products," 1967.

† Offset equals 0.2 per cent.

‡ In QQ-A-200/8b, 11b, 12b and 13, values for T6 temper apply also for extrusions heat treated and aged by user (T62 temper).

\*\* Lower than in Federal specifications.

†† "T73X" signifies T73-type temper for 7075 when heat treated and aged by user. Standard designation not yet assigned.

TABLE XII  
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES  
OF STRESS-RELIEVED STRENGTHENED 2014-T510 ALUMINUM ALLOY EXTRUSIONS  
[AFZ3(615)-2580]

Sample Number	Gross Section Area, in. <sup>2</sup>	Loca- tion*	T/S(L)		T/S(ST)		T/S(T)		C/S(L)		C/S(ST)		C/S(T)	
			T/2	T/2	T/2	T/2	T/2	T/2	T/2	T/2	T/2	T/2	T/2	T/2
0.061	0.30	317950	1.11	--	1.10	--	1.04	--	--	--	--	--	--	--
0.070	0.24	318017†	T/2	--	--	--	1.01	--	1.01	--	--	--	--	--
0.075	0.16	317951	T/2	--	--	--	1.01	--	1.01	--	--	--	--	--
0.245	0.45	318130†	T/2	--	--	--	1.02	--	1.02	--	--	--	0.69	--
0.250	0.7	319154	T/2	1.06	--	1.01	1.03	--	1.12	--	0.71	0.70	--	--
0.271	0.40	317994	T/2	1.06	--	0.99	--	0.99	--	0.70	--	--	--	--
0.625	0.50	317952	T/2	--	--	--	0.97	--	--	0.68	--	--	--	--
0.625	0.55	340291	T/2	--	--	--	0.95	--	--	0.54	--	--	--	--
0.750	1.1	317924	T/2	0.92	--	0.89	--	1.02	0.96	--	0.56	--	--	--
1.557	2.2	318046	D/4	0.92	--	0.92	--	1.03	0.96	--	0.57	--	--	--

\* T = thickness; W = width; D = diameter.

† Producer B; all others from Producer A.

**TABLE XIII**  
**MATENS AMONG THE TESTS, COMPRESSIVE AND SHEAR PROPERTIES  
 OF STRESS-RELIEVED STRENGTHED 2024-T5510 ALUMINUM ALLOY EXTRUSIONS**  
 [ASTM (615)-3580]

Sample Number	Cross- Sectional Area, in. <sup>2</sup>	Load- tion	F <sub>ST</sub> (C)	F <sub>ST</sub> (F)	F <sub>ST</sub> (G)	F <sub>ST</sub> (H)	F <sub>ST</sub> (I)	F <sub>ST</sub> (J)	F <sub>ST</sub> (K)	F <sub>ST</sub> (L)	F <sub>ST</sub> (M)	F <sub>ST</sub> (N)	F <sub>ST</sub> (O)	F <sub>ST</sub> (P)	F <sub>ST</sub> (Q)	F <sub>ST</sub> (R)	F <sub>ST</sub> (S)	F <sub>ST</sub> (T)	F <sub>ST</sub> (U)	F <sub>ST</sub> (V)	F <sub>ST</sub> (W)	F <sub>ST</sub> (X)	F <sub>ST</sub> (Y)	F <sub>ST</sub> (Z)		
0.075	0.70	318128*	1/2	1.07	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.094	0.20	318019*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.101	0.23	317881*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.103	0.31	317904*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.120	0.67	318086*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.151	0.82	317886	1/2	0.97	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
0.255	2.6	317942	1/2	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	
0.0298	4.3	318047	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.0375	0.82	317943	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.0510	10.1	317926	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.325	1.9	318020*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.550	1.9	317856	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.632	5.8	317945	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.815	3.9	340415*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.950	4.6	317944	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.150	5.6	318077	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.200	3.9	317946	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.450	7.3	318021*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.705	4.8	340213	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.520	8.8	318139*	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.000	24.0	340214	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.760	29.6	318046	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.500	30.7	340388	1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

\* T - Thickens; V - Width

† Producer B; all others from Producer A

‡ Samples were in the T5511 temper

TABLE XIV  
RATIOS AMONG THE TENSILE, COMPRESSIVE, AND SHEAR PROPERTIES  
OF STRESS-RELIEVED STRETCHED 2024-T8510 ALUMINUM ALLOY EXTRUSIONS  
[AF33(615)-3550]

Sample Number	Section thickness, in.	Cross-sectional area, in. <sup>2</sup>	Loca-tion*	T <sub>S</sub> (T)		T <sub>S</sub> (S) <sub>T</sub>		T <sub>S</sub> (S) <sub>L</sub>		T <sub>S</sub> (S) <sub>T</sub>		T <sub>S</sub> (S) <sub>L</sub>		S <sub>T</sub> (T)		S <sub>T</sub> (S) <sub>T</sub>		S <sub>T</sub> (S) <sub>L</sub>	
				T <sub>S</sub> (T)	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	T <sub>S</sub> (L)	T <sub>S</sub> (S) <sub>T</sub>	
0.075	0.70	318022†	T/2	1.07	—	1.02	—	1.02	—	1.07	—	1.02	—	1.02	—	1.07	—	1.07	—
0.094	0.70	318124†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.102	0.73	317837	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.106	0.71	317833	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.120	0.67	318023†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.151	0.62	317839	T/2	1.05	—	1.05	—	1.05	—	1.04	—	1.05	—	1.05	—	1.05	—	1.05	—
0.258	2.8	317850	T/2	0.97	—	0.92	—	0.95	—	1.04	—	1.05	—	1.05	—	1.05	—	1.05	—
0.268	4.2	318052	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.375	10.1	317891	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.385	10.1	318024†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.550	1.9	317922	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.612	1.8	317954	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.815	2.9	318419†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.920	4.6	317853	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.150	5.6	318078	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.230	5.6	317895	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.450	7.8	318033†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.705	4.8	318029	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.530	8.3	318020†	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.760	29.6	318079	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.000	24.0	318025	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.500	30.7	318039	T/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

\* T = Tensile; S = Shear.  
† Sample 3; all others from Product A.  
‡ Sample was in the T8511 temper.

**TABLE IV**  
**RATIO AMONG THE STRESS, COMPRESSIVE AND SHEAR PROPERTIES**  
**OF STRESS-RELIEVED STRETCHED 6061-T6510 ALUMINUM ALLOY EXTENSIONS**  
**API3 (615)-3580**

Sample Cross- Sectional Area, In. <sup>2</sup>	Section Thickness, In.	Load Capacity, Lbs.	Tensile Strength, T.S. <sup>a</sup>	Compressive Strength, C.S. <sup>a</sup>	Shear Strength, S.S. <sup>a</sup>	Ratio T.S./C.S.	Ratio T.S./S.S.	Ratio C.S./S.S.
0.050	0.12	218236 <sup>b</sup>	T/2	0.98	--	0.98	0.98	0.98
0.075	0.19	517857	T/2	0.92	--	0.92	0.92	0.92
0.093	0.27	518027 <sup>b</sup>	T/2	0.97	--	0.97	0.97	0.97
0.125	0.61	517846 <sup>b</sup>	T/2	0.97	--	0.97	0.97	0.97
0.126	0.39	517847 <sup>b</sup>	T/2	--	--	--	--	--
0.245	1.1	340421 <sup>b</sup>	T/2	1.00	--	0.96	1.07	0.78
0.250	0.36	317848 <sup>b</sup>	T/2	1.07	--	1.07	1.10	0.72
0.254	0.67	340422 <sup>b</sup>	T/2	1.07	--	1.07	1.10	0.74
0.310	6.3	517905 <sup>b</sup>	T/2	1.07	1.07	1.07	1.07	0.76
0.315	5.8	517953 <sup>b</sup>	T/2	1.07	1.07	1.07	1.07	0.74
0.375	8.6	517987 <sup>b</sup>	T/2	0.98	0.98	0.98	0.98	0.73
0.376	7.7	518083 <sup>b</sup>	T/2	0.98	0.98	0.98	0.98	0.73
0.918	2.5	517906 <sup>b</sup>	T/2, V/2	0.97	0.97	0.97	0.97	0.72
1.004	2.0	340423 <sup>b</sup>	T/2, V/2	1.07	0.97	1.07	1.07	0.69
1.240	2.7	517907 <sup>b</sup>	T/2, V/2	0.89	0.86	0.86	0.86	0.67
1.960	4.4	317896 <sup>b</sup>	T/2, V/2	0.87	--	0.86	1.00	0.86
3.000	15.0	340226 <sup>b</sup>	T/2, V/2	0.88	0.91	0.86	1.00	0.87
6.500	35.2	317897 <sup>b</sup>	D/2	0.88	--	0.82	0.92	0.82

\* T - Tensile; V - Vitch; D - Diameter  
<sup>a</sup> Producer B; all others from Producer A

<sup>b</sup> Ratio T.S./C.S. = 0.92

**TABLE VI**  
 TESTS MADE ON TENSILE, COMPRESSION AND SHEAR PROPERTIES  
 OF STRESS-RELIEVED STRETCHED 7075-T650 ALUMINUM ALLOY RATIONS  
 (AF22(615)-2580)

Sample Number	Cross- Sectional Area, in. <sup>2</sup>	Loca- tion*	T <sub>U</sub> ( $\sigma$ ) <sup>†</sup>	T <sub>S</sub> ( $\sigma$ ) <sup>†</sup>	T <sub>S</sub> ( $\tau$ ) <sup>†</sup>								
3.055	0.18	317889	T/2	0.97	-	0.96	-	0.96	1.00	-	-	-	-
0.065	0.27	317851	T/2	0.98	-	0.96	-	0.96	0.98	1.03	1.03	1.03	1.03
0.080	0.18	317858	T/2	0.98	-	0.96	-	0.96	1.01	-	-	-	-
0.133	0.97	318029	T/2	0.98	-	0.96	-	0.96	1.01	-	-	-	-
0.160	0.26	318030†	T/2	0.98	-	0.97	-	0.97	1.01	1.10	-	-	-
0.209	1.12	318043	T/2	0.98	-	0.97	-	0.97	1.07	-	-	-	-
0.260	1.2	318022†	T/2	0.98	-	0.96	-	0.96	1.01	-	-	-	-
0.311	0.51	317908	T/2	0.97	-	0.96	-	0.96	1.08	1.05	1.05	1.05	1.05
0.325	2.4	310437	T/2	0.97	-	0.96	-	0.96	1.01	1.07	1.07	1.07	1.07
0.273	2.2	317924	T/2	0.95	-	0.95	-	0.95	0.98	1.05	1.05	1.05	1.05
0.428	1.2	317859	T/2	0.93	-	0.93	-	0.93	0.97	1.05	1.05	1.05	1.05
0.463	1.9	318032†	T/2	0.97	-	0.97	-	0.97	1.02	1.08	1.08	1.08	1.08
0.935	7.2	310155	T/2 W/2	0.97	-	0.97	-	0.97	0.98	1.00	1.00	1.00	1.00
1.022	1.8	3118023†	T/2 W/4	0.98	-	0.98	-	0.98	1.02	1.08	1.08	1.08	1.08
1.188	27.1	317850	T/2 W/4	0.97	-	0.96	-	0.96	0.98	1.02	1.02	1.02	1.02
1.500	1.8	317885	D/2	0.98	-	0.98	-	0.98	1.03	1.08	1.08	1.08	1.08
2.000	5.1	317881	D/2	0.97	-	0.97	-	0.97	1.02	1.08	1.08	1.08	1.08
2.190	17.0	318137†	T/4 W/4	0.96	-	0.92	-	0.92	0.99	1.01	1.01	1.01	1.01
2.750	8.2	310404	T/4 W/2	0.98	-	0.98	-	0.98	0.98	1.02	1.02	1.02	1.02
3.040	13.8	316138†	T/4 W/4	0.98	-	0.97	-	0.97	0.95	1.02	1.02	1.02	1.02
3.090	24.3	310391	T/4 W/4	0.92	-	0.92	-	0.92	0.91	0.94	0.94	0.94	0.94

\* T = Thickness; W = Width, D = Diameter  
 † Producer B; all others from Producer A

TABLE XVI  
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES  
OF STRESS-RELIEVED STRETCHED 7075-T73510 ALUMINUM ALLOY EXTRUSIONS  
[AF33(615)-3580]

Sample	Cross-Sectional Area, in. <sup>2</sup>	Loca-tion	T <sub>S</sub> (UT)	T <sub>S</sub> (ST)	T <sub>S</sub> (LT)	T <sub>C</sub> (UT)	T <sub>C</sub> (ST)	T <sub>C</sub> (LT)	T <sub>SH</sub> (UT)	T <sub>SH</sub> (ST)	T <sub>SH</sub> (LT)
Thickness, in.	Number										
0.080	0.18	317852	T/2	0.97	—	0.98	—	—	1.00	1.03	—
0.209	0.51	340552	T/2	—	—	—	—	—	1.05	1.06	—
0.213	0.51	317909	T/2	—	—	1.01	—	—	1.01	1.04	—
0.325	2.4	340438	T/2	0.97	—	0.97	—	—	1.02	1.04	—
0.375	2.2	317900	T/2	0.95	—	0.97	—	—	1.03	1.06	—
0.438	7.2	317910	T/2	0.95	—	1.00	—	—	1.00	1.04	—
0.925	7.2	340282	T/2, W <sup>1/4</sup>	0.97	—	0.96	—	—	1.00	1.02	—
1.000	5.1	340439	T/2, W <sup>1/4</sup>	0.98	—	0.94	—	—	1.00	1.02	—
1.500	1.8	317956	D/2	0.90	—	0.85	—	—	1.02	—	—
2.000	3.1	317948	D/4	—	—	—	—	—	1.02	—	—
2.750	8.2	340440	T/2, W <sup>1/4</sup>	0.93	—	0.86	—	—	1.02	0.93	—
			T/2, W/2	0.92	—	0.89	—	—	1.01	0.95	—
				0.97	—	0.89	—	—	1.01	0.95	—

\* t = thickness; W = width, D = diameter

TABLE XVII  
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES  
OF STRESS-RELIEVED STRENGTHED 7079-T6510 ALUMINUM ALLOY EXTRUSIONS  
[NP33(615)-3586]

Sample		Sectional Area, in. <sup>2</sup>	Number	Loca-tion	Tensile		Compressive		Shear		Tensile Strength, ksi	Compressive Strength, ksi	Shear Strength, ksi
Section Thickness, in.	in.				T/S(L)	T/S(T)	T/S(L)	T/S(T)	T/S(L)	T/S(T)			
0.080	0.15	340405	T/2	--	--	--	--	--	0.99	--	--	--	--
0.146	1.1	340406	T/2	1.00	--	0.97	--	0.99	1.06	--	--	--	--
0.161	0.72	340252	T/2	0.97	--	0.95	--	0.99	1.06	--	--	--	--
0.251	0.82	340253	T/2	0.95	--	0.92	--	1.01	1.01	--	0.96	0.95	--
0.500	4.2	340424†	T/2,W/2	0.96	--	0.94	--	1.00	1.04	--	0.54	0.53	--
			T/2,W/2	0.98	--	0.96	--	1.01	1.02	--	0.55	0.54	--

\* T - Thickness; W - Width  
† Producer B; all others F - Prod : ser A

**TABLE XI**  
**RATIO OF TENSILE STRENGTH, COMPRESSIVE AND SHEAR PROPERTIES  
 OF STRESS-RELIEVED STRENCO 718-5510 ALUMINUM ALLOY EXTENSIONS**  
**[ASTM (615)-5580]**

Sample Number	Section Thickness, in. <sup>2</sup>	Section Area, in. <sup>2</sup>	Loca- tion <sup>a</sup>	Tensile Strength	Compressive Strength	Shear Strength	Ratio <sup>b</sup>	Ratio <sup>b</sup>	Ratio <sup>b</sup>
0.063	0.37	317902	T/2	0.99	-	0.97	-	1.01	1.04
		310126	T/2	1.00	-	0.98	-	1.00	1.06
0.066	0.35	318016	T/2	0.99	-	0.98	-	1.00	1.06
0.142	0.42	318025 <sup>c</sup>	T/2	-	-	-	-	1.06	-
0.144	0.42	317925 <sup>c</sup>	T/2	-	-	-	-	1.06	-
0.149	0.49	317925 <sup>c</sup>	T/2	0.95	-	0.94	-	0.98	-
0.150	1.1	310125 <sup>c</sup>	T/2	1.02	-	1.02	-	1.02	-
0.180	1.6	310125 <sup>c</sup>	T/2	1.02	-	1.02	-	1.02	-
0.180	1.6	310127 <sup>c</sup>	T/2	0.94	-	0.92	-	0.99	-
0.261	0.69	317926	T/2	-	-	-	-	1.00	-
0.265	0.88	317927	T/2, V/2	0.97	-	0.94	-	1.01	-
0.685	6.9	317927	T/2, V/2	0.97	-	0.94	-	1.02	-
0.780	1.7	310225 <sup>c</sup>	T/2, V/2	0.99	-	0.86	-	1.01	-
1.200	3.9	318125 <sup>c</sup>	T/2, V/2	0.92	-	0.89	-	1.02	-
1.438	6.4	317957	T/2, V/2	0.84	-	0.81	-	1.02	-
2.160	15.5	318140 <sup>c</sup>	T/2, V/2	0.92	0.86	0.84	1.00	0.99	0.97
				0.93	0.86	0.84	1.01	0.99	0.97

<sup>a</sup> T = Transverse; V = Vertical.

<sup>b</sup> Producer B; all others from Producer A.

**TABLE IX**  
**RATIOS AMONG THE TENSILE, COMPRESSION AND SHEAR PROPERTIES**  
**OF ALUMINUM ALLOY EXTRUSIONS IN THE HOT-TREATED-AS-USED STATES**  
**[ASTM (615)-380]**

Alloy and Temper	Sample			Tensile Strength Ratio	Compression Strength Ratio	Shear Strength Ratio	Modulus of Elasticity Ratio	Modulus of Rupture Ratio	Modulus of Shear Ratio
	Section Thickness, in.	Cross-sectional Area, in. <sup>2</sup>	Number						
2014-T62	0.300 0.399	6.3 1.4	318084 318085	T/2 T/2	1.01 0.98	— —	0.38 0.38	— —	0.56 0.56
2024-T42	0.064 0.083 0.130 0.250 2.562	0.27 0.27 2.1 0.64 6.4	318088 <sup>a</sup> 318086 <sup>a</sup> 340241 <sup>a</sup> 340243 <sup>a</sup> 340245	T/2 T/2 T/2 T/2 T/2, W/2	1.06 1.02 1.00 0.99 0.79	— 0.97 0.91 0.89 0.79	1.03 1.02 1.01 1.00 1.01	1.04 1.06 1.08 1.07 0.84	— — — — 0.48
2024-T62	0.064 0.083 0.250 2.562	0.27 0.27 2.64 6.4	318089 <sup>a</sup> 318087 <sup>a</sup> 340244 <sup>a</sup> 340246 <sup>a</sup>	T/2 T/2 T/2, W/4 T/2, W/2	1.06 1.05 0.96 0.95	— — 0.98 0.95	— — 1.03 1.04	1.04 1.07 1.02 1.04	— — — 0.57
6061-T62	0.246 1.625	4.6 3.9	318090 318091	T/2, W/4 T/2, W/2	0.96 0.98	— —	0.97 0.97	1.00 1.03	0.71 0.73
7075-T62	0.064 0.28 0.300 1.225 2.250	0.34 0.34 0.17 21.2 4.1	313094 <sup>a</sup> 318092 <sup>a</sup> 318096 <sup>a</sup> 318098 <sup>a</sup> 318190	T/2 T/2 T/2, W/4 T/2, W/2 D/2 D/2	0.96 0.95 0.95 0.95 0.86	— — — — —	0.97 0.97 0.96 0.95 0.81	1.06 1.06 1.05 1.05 1.02	1.09 1.06 1.05 1.05 0.88
7075-T73X	0.064 0.28 0.300 1.225 2.250	0.34 0.34 0.17 21.2 4.1	318095 <sup>a</sup> 318093 <sup>a</sup> 318097 <sup>a</sup> 318099 <sup>a</sup> 318191	T/2 T/2 T/2, W/4 T/2, W/2 D/4 D/2	0.96 0.97 0.97 0.96 0.95	— — — — —	0.96 0.96 0.95 0.97 0.89	1.06 1.07 1.06 1.05 1.03	1.06 1.07 1.02 1.02 0.94
7078-T62	0.050 0.051 0.403	0.15 0.15 3.0	340247 318087 <sup>a</sup> 340249 <sup>a</sup>	T/2 T/2 T/2	0.99 0.98 0.98	— — —	0.99 0.98 0.98	1.05 1.09 1.04	— — 0.55

\* T - Thickness; W - Width; D - Diameter  
+ Producer B; all others Producer A

**TABLE XX**

TABLE XII  
RATIOS OF MEANTO TO TENSILE PROPERTIES OF STRESS-SOLVED STRENGTHED  
2014-T6510 ALUMINUM ALLOY EXTRUSIONS  
[ASTM (65)-3580]

Sample Cross- Sec- tional Thick- ness, in. <sup>2</sup>	Section Num- ber	Loca- tion	Producer A						Producer B					
			Ratios (L)	Ratios (W)	Ratios (D)	Ratios (L)	Ratios (W)	Ratios (D)	Ratios (L)	Ratios (W)	Ratios (D)	Ratios (L)	Ratios (W)	Ratios (D)
0.061	0.30	317950	T/2	1.57	2.07	1.42	1.67	--	--	--	--	--	--	--
0.078	0.24	318017	T/2	1.61	2.08	1.43	1.68	--	--	--	--	--	--	--
0.246	0.45	318136	T/2	1.72	2.14	1.56	1.78	--	--	--	--	--	--	--
0.259	2.7	319154	T/2	1.68	2.18	1.50	1.85	--	--	--	--	--	--	--
0.271	0.40	317994	T/2	1.98	2.07	1.46	1.69	--	--	--	--	--	--	--
0.750	1.4	317924	T/2	1.43	1.86	1.32	1.49	--	--	--	--	--	--	--
1.657	2.2	318046	D/2	1.43	1.87	1.33	1.56	--	--	--	--	--	--	--
			D/2	1.45	1.81	1.29	1.50	--	--	--	--	--	--	--

\* t - thickness; W - Width; D - Diameter

† Producer B: all others from Producer A

NOTE: L - Longitudinal; W - Long-transverse

**TABLE XIII**  
**RATIO OF MEANING TO STRENGTH PROPERTIES OF STRESS-STRENGTHENED  
 2024-T3510 ALUMINUM ALLOY EXTRUSIONS**  
**[ASTM (65)-3500]**

Sample	Cross- Sec- tional Area, in. <sup>2</sup>	Section Stock- size, in.	Loca- tion	Producer A				Producer B			
				W/L	W/H	W/T	W/I <sup>2</sup>	W/L	W/H	W/T	W/I <sup>2</sup>
0.075	0.70	318132†	T/2	1.47	1.81	1.48	1.78	—	—	—	—
0.098	0.32	318019†	T/2	1.52	2.00	1.49	1.69	—	—	—	—
0.103	0.31	317985	T/2	1.51	1.99	1.48	1.76	—	—	—	—
0.106	0.27	318018‡	T/2	1.52	1.96	1.48	1.76	—	—	—	—
0.151	0.82	317886	T/2	1.46	1.77	1.44	1.68	—	—	—	—
0.255	2.8	317942	T/2	1.56	1.56	1.21	1.38	1.34	1.66	1.31	1.60
0.255	4.2	318047	T/2	1.55	1.57	1.20	1.39	1.32	1.68	1.25	1.60
0.275	6.0	317942	T/2	1.57	1.67	1.23	1.49	1.42	1.88	1.27	1.80
0.500	10.1	317926	T/2, V/2	1.63	1.73	1.36	1.66	—	—	—	—
0.500	1.9	318020‡	T/2, V/2	1.63	1.63	1.57	1.61	—	—	—	—
0.500	1.9	317886	T/2, V/2	1.51	1.68	1.55	1.55	—	—	—	—
0.642	5.8	317955	T/2, V/2	1.51	1.56	1.26	1.31	1.26	1.51	1.26	1.51
0.815	3.9	340018†	T/2, V/4	1.32	1.24	1.24	1.52	—	—	—	—
0.950	4.6	317944	T/2, V/4	1.34	1.27	1.27	1.55	—	—	—	—
1.150	5.6	318077	T/2, V/4	1.32	1.22	1.22	1.59	1.27	1.53	1.21	1.53
1.200	3.9	317946	T/2, V/4	1.35	1.27	1.27	1.58	—	—	—	—
1.450	7.3	318021†	T/2, V/4	1.31	1.24	1.24	1.49	—	—	—	—
1.705	4.8	340013	T/2, V/4	1.34	1.24	1.24	1.54	—	—	—	—
2.520	8.8	318133†	T/2, V/4	1.32	1.24	1.24	1.50	—	—	—	—
4.000	24.0	340214	T/2, V/4	1.38	1.25	1.25	1.47	1.22	1.53	1.18	1.47
2.760	29.6	318040	T/2, V/4	1.18	1.65	1.27	1.54	—	—	1.15	1.42
4.500	30.7	340288	T/2, V/2	1.26	1.22	1.20	1.50	1.20	1.27	1.11	1.50
			T/2, V/2	1.27	1.20	1.20	1.49	1.19	1.24	1.16	1.44
			T/2, V/2	1.27	1.20	1.20	1.51	1.24	1.28	1.19	1.52
			T/2, V/2	1.21	1.20	1.20	1.44	1.24	1.28	1.19	1.51

\* T - Thickness; V - Width  
 † Producer B; all others from Producer A  
 ‡ Samples were in the T351 temper

NOTE: L - Longitudinal; I<sup>2</sup> - Long-Transverse

TABLE XIII  
RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STAINLESS  
2024-T8510 ALUMINUM ALLOY EXTENSIONS  
[1953 (615)-5580]

Sample Section Size- Width, Area, in. in. in.	Section Size- Width, Area, in. in. in.	Load- tion:	Producer A						Producer B					
			W/L	W/L	W/L	W/L	W/L	W/L	W/L	W/L	W/L	W/L	W/L	W/L
0.075	0.70	3180221	F/2	1.92	1.95	1.45	1.68	—	—	—	—	—	—	—
0.094	0.70	3180241	F/2	1.94	1.95	1.44	1.71	—	—	—	—	—	—	—
0.101	0.72	317887	F/2	1.94	1.97	1.44	1.78	—	—	—	—	—	—	—
0.106	0.52	3180288	F/2	1.53	1.44	1.44	1.63	—	—	—	—	—	—	—
0.120	0.72	3180227	F/2	2.00	1.44	1.63	—	—	—	—	—	—	—	—
0.151	0.82	317889	F/2	1.57	2.05	1.51	1.76	—	—	—	—	—	—	—
0.256	2.8	317890	F/2	1.46	1.89	1.40	1.66	1.47	1.88	1.41	1.68	—	—	—
0.258	4.2	3180282	F/2	1.49	1.82	1.48	1.69	1.45	1.88	1.44	1.58	—	—	—
0.275	0.82	317891	F/2	1.52	1.77	1.47	1.65	1.45	1.77	1.44	1.52	—	—	—
0.310	10.1	317892	F/2	1.77	1.75	1.53	1.60	1.45	1.77	1.44	1.52	—	—	—
0.325	1.9	3180224	F/2	1.60	1.70	1.40	1.58	1.40	1.70	1.44	1.52	—	—	—
0.328	1.9	317892	F/2	1.60	1.70	1.40	1.58	1.40	1.70	1.44	1.52	—	—	—
0.612	5.8	317894	F/2	1.46	1.40	1.40	1.40	1.41	1.82	1.36	1.63	—	—	—
0.815	3.9	3404129	F/2	1.46	1.40	1.42	1.42	1.45	1.87	1.45	1.45	—	—	—
0.950	4.6	317895	F/2	1.46	1.41	1.41	1.41	1.45	1.87	1.45	1.45	—	—	—
1.150	5.6	3180278	F/2	1.46	1.40	1.45	1.45	1.45	1.87	1.45	1.45	—	—	—
1.200	3.9	317895	F/2	1.46	1.40	1.45	1.45	1.45	1.87	1.45	1.45	—	—	—
1.450	7.3	3180251	F/2	1.46	1.40	1.45	1.45	1.45	1.87	1.45	1.45	—	—	—
1.705	4.8	340169	F/2	1.47	1.46	1.42	1.49	1.45	1.86	1.44	1.44	—	—	—
2.520	8.8	3404201	F/2	1.47	1.46	1.45	1.45	1.45	1.86	1.44	1.44	—	—	—
2.760	29.6	3180279	F/2	1.47	1.42	1.45	1.45	1.45	1.86	1.44	1.44	—	—	—
4.000	24.0	340225	F/2	1.47	1.42	1.45	1.45	1.45	1.86	1.44	1.44	—	—	—
4.500	30.7	340389	F/2	1.47	1.42	1.45	1.45	1.45	1.86	1.44	1.44	—	—	—

\* F = Thickness, V = Width  
Producer B; all others from Producer A

† Sample was in the 1951 temper

‡ Bearing specimen failed before reaching yield stress (2 per cent offset).

NOTE: L = Longitudinal; LT = Long-transverse

**TABLE XIV**  
**RATIOS OF THICKNESS TO LENGTH PROPERTIES OF STRESS-ELEVATED STRUCTURAL  
 HIGH-SILO ALUMINUM ALLOY KINETICS**

[ANSI (615)-3580]

Sample Number	Section Dimensions, in.	Cross- sectional area, sq. in.	Loca- tion Number	Producer A						Producer B					
				W/D 1.5	W/D 2.0	W/D 2.5	W/D 3.0	W/D 3.5	W/D 4.0	W/D 1.5	W/D 2.0	W/D 2.5	W/D 3.0	W/D 3.5	W/D 4.0
0.050	0.42	3181366	9/2	1.76	2.38	1.98	1.79	1.94	2.29	1.72	1.98	1.72	1.72	1.72	1.72
	0.075	0.59	3178577	1-1/2	1.74	2.32	1.90	1.80	--	--	--	--	--	--	--
	0.093	0.77	3178277	1-1/2	1.64	2.10	1.50	1.68	--	--	--	--	--	--	--
	0.125	1.01	317846	1-1/2	1.64	2.10	1.50	1.68	--	--	--	--	--	--	--
	0.245	1.1	3404211	1/2	1.79	2.40	1.59	1.83	--	--	--	--	--	--	--
	0.254	0.97	3404221	1/2	1.77	2.32	1.58	1.81	--	--	--	--	--	--	--
	0.310	6.3	317905	1/2	1.67	2.13	1.52	1.69	2.17	2.16	1.62	1.77	1.69	1.72	1.72
	0.315	5.8	317953	1/2	1.71	2.21	1.62	1.67	1.72	2.27	1.68	1.77	1.70	1.79	1.79
	0.375	8.6	317927	1/2	1.74	2.21	1.62	1.69	1.76	2.26	1.69	1.79	1.72	1.81	1.81
	0.575	7.7	318083	1/2	1.71	2.17	1.64	1.74	2.22	1.64	1.76	1.71	1.79	1.78	1.78
	0.918	1.3	317906	1/2, 5/8	1.70	2.21	1.64	1.75	--	--	--	--	--	--	--
	1.004	2.0	3404231	1/2, 5/8	1.65	2.13	1.49	1.65	--	--	--	--	--	--	--
	1.240	2.7	317907	1/2, 5/8	1.67	2.20	1.77	1.79	--	--	--	--	--	--	--
	1.960	4.4	317896	9/2, 5/8	1.47	1.87	1.26	1.52	--	--	--	--	--	--	--
	3.000	15.0	340226	9/2, 5/8	1.44	1.85	1.27	1.47	1.41	1.81	1.50	1.56	1.26	1.26	1.26
	6.500	33.2	317897	7/2, 5/8	1.45	1.87	1.28	1.29	1.24	1.74	1.20	1.42	1.24	1.24	1.24
			D/2	1.41	1.82	1.24	1.48	1.35	1.74	--	1.41	1.80	1.24	1.24	1.24
			D/2	1.40	1.79	1.24	1.48	1.35	1.74	--	--	--	--	--	--

\* T = thickness; W = width; D = diameter

• Producer B; all others from Producer A

NOTE: L = longitudinal; LR = Long-transverse

**TABLE XIV**  
 RATIOS OF MEANING TO SPECIFIC PROPERTIES OF STEEL-REINFORCED CONCRETE  
 (W2216151-3580)

Sample Cross- Sectional Area, in. <sup>2</sup> , in. <sup>3</sup> ,	Section Thickness, in., Number	Loca- tion*	Strength						Stiffness					
			W-1.5	W-2.0	W-2.5	W-3.0	W-3.5	W-4.0	E-1.5	E-2.0	E-2.5	E-3.0	E-3.5	E-4.0
0.065	0.18	318999	T/2	1.46	1.82	1.35	1.55	--	--	--	--	--	--	--
0.065	0.27	318051 <sup>†</sup>	T/2	1.48	1.86	1.35	1.61	--	--	--	--	--	--	--
0.080	0.18	318958	T/2	1.42	1.61	1.34	1.53	--	--	--	--	--	--	--
0.133	0.97	3180297	T/2	1.48	1.86	1.41	1.63	--	--	--	--	--	--	--
0.160	0.26	3180301 <sup>†</sup>	T/2	1.45	1.85	1.37	1.62	--	--	--	--	--	--	--
0.209	1.2	340403	T/2	1.38	1.75	1.34	1.62	1.45	1.77	1.29	1.51	--	--	--
0.260	1.23	3180281 <sup>†</sup>	T/2	1.47	1.85	1.35	1.54	1.44	1.76	1.33	1.64	--	--	--
0.325	2.4	340437	T/2	1.43	1.82	1.33	1.59	1.49	1.71	1.30	1.60	--	--	--
0.375	2.2	317954	T/2	1.42	1.82	1.29	1.59	1.50	1.75	1.40	1.67	--	--	--
0.418	7.2	317859	T/2	1.47	1.85	1.41	1.60	1.56	1.75	1.40	1.67	--	--	--
0.465	1.9	3180327	T/2	1.45	1.85	1.30	1.56	1.45	1.75	1.30	1.67	--	--	--
0.975	7.2	340155	T/2,W/2	1.45	1.83	1.33	1.56	1.47	1.79	1.32	1.61	--	--	--
1.023	1.8	3180223	T/2,W/2	1.46	1.82	1.33	1.56	1.49	1.72	1.32	1.61	--	--	--
1.188	27.1	317860	T/2,W/2	1.37	1.81	1.26	1.49	1.52	1.69	1.40	1.61	1.26	1.47	1.51
1.500	1.8	317955	T/2,W/2	1.47	1.82	1.38	1.53	1.51	1.68	1.42	1.64	1.30	1.53	1.50
2.000	3.1	317851	D/2,W/2	1.33	1.67	1.26	1.40	1.36	1.56	1.26	1.40	--	--	--
2.190	17.0	3181371 <sup>†</sup>	T/4,W/2	1.32	1.71	1.23	1.44	1.43	1.68	1.37	1.66	1.23	1.35	1.25
2.750	8.2	340404	T/4,W/2	1.35	1.74	1.28	1.48	1.48	1.66	1.42	1.68	1.26	1.36	1.26
3.040	13.8	3181381 <sup>†</sup>	T/4,W/4	1.29	1.75	1.32	1.57	1.37	1.72	1.35	1.60	1.23	1.33	1.27
3.090	28.3	340391	T/4,W/2	1.43	1.79	1.32	1.54	1.42	1.73	1.38	1.62	1.27	1.35	1.28
			T/2,W/2	1.39	1.81	1.30	1.56	1.40	1.73	1.38	1.65	1.29	1.35	1.29

\* T - Thickness; W - Width; D - Diameter  
 † Producer B; all others from Producer A

NOTE: L - Longitudinal; Lt - Long-transverse

**TABLE XVI**  
**RATIO OF MEANING TO THEORETICAL PROPERTIES OF STRESS-RELIEVED STEELSCORD**  
**7075-T7350 ALUMINUM ALLOY EXTRUSIONS**  
**[AF3(615)-3580]**

Sample Number*	Section Thickness, in.	Gross-Sectional Area, in. <sup>2</sup>	Location	Flatwise				Transverse			
				ES (L)	ES (W)	ES (L)	ES (W)	ES (L)	ES (W)	ES (L)	ES (W)
0.060 0.18	317662	T/2	1.52	1.94	1.45	1.69	1.49	1.97	1.37	1.68	--
0.209 1.2	310393	T/2	1.45	1.85	1.39	1.67	1.48	1.92	1.45	1.74	--
0.325 2.1	340438	T/2	1.49	1.92	1.44	1.70	1.54	1.98	1.45	1.78	--
0.435 2.2	317900	T/2	1.51	1.96	1.44	1.74	1.54	1.98	1.45	1.78	--
0.435 7.2	317910	T/2	1.53	1.98	1.47	1.76	1.56	1.98	1.48	1.78	--
0.935 7.2	340292	T/2, W/2	1.47	1.89	1.37	1.65	1.45	1.88	1.38	1.62	--
1.000 5.7	340439	T/2, W/2	1.50	1.92	1.40	1.66	1.50	1.92	1.37	1.66	--
1.500 1.8	317956	D/2	1.39	1.85	1.32	1.55	--	--	1.28	1.75	--
2.000 3.1	317948	D/4	1.41	1.85	1.28	1.54	--	--	1.21	1.71	--
2.750 8.2	340440	T/4, W/2	1.43	1.85	1.31	1.56	--	--	1.16	1.86	--
		T/2, W/2	1.43	1.85	1.32	1.56	--	--	1.16	1.86	--

\* T - Thickness; W - Width; D - Diameter  
 NOTE: L - Longitudinal; WF - Long-Transverse

**TABLE XXVII**  
**RATIO OF STRENGTH TO STRESS PROPERTIES OF STRESS-RELIEVED STRENGTHED**  
**70-90-510 ALUMINUM ALLOY EXTENSIONS**  
**[AFS(615)-3580]**

Sample Number	Cross- sec- tional area, in. <sup>2</sup>	Loca- tion <sup>a</sup>	Failure						Ratio of strengthed to stress-relieved strength
			T/2	T/4	W/2	W/4	L/2	L/4	
0.080	0.15	340405	1.46	1.86	1.35	1.54	--	--	--
0.146	1.1	340406	T/2	1.46	1.83	1.41	1.60	1.50	1.37
0.161	0.72	3404052	T/2	1.44	1.81	1.34	1.55	--	1.62
0.251	0.82	3404053	T/2	1.46	1.82	1.33	1.50	--	--
0.500	4.2	340424+	T/2,W/4	1.47	1.81	1.28	1.50	1.43	1.29
			T/2,W/2	1.44	1.81	1.31	1.50	--	1.57

\* T = Thickness; W = Width.

<sup>a</sup> Producer B; all others from Producer A.

NOTE: L = Longitudinal; LT = Long-Transverse.

**TABLE XXVII**  
**RATIO OF BENDING TO TENSILE PROPERTIES OF STRESS-RELIEVED STEELROD**  
**7178-T6510 ALUMINUM ALLOY Extrusions**  
**[APG(615)-5580]**

Section Cross- Sec- tional Area, in. <sup>2</sup>	Cros- s- sec- tional area, in. <sup>2</sup>	Look- Up Number	Look- Up Number	Platice						Eggcrate					
				W (in.)	W (in.)	W (in.)	W (in.)	W (in.)	W (in.)						
0.063	0.37	317902	T/2	1.40	1.77	1.31	1.55	--	--	--	--	--	--	--	--
0.066	0.35	340466	T/2	1.50	1.82	1.36	1.66	--	--	--	--	--	--	--	--
0.112	1.0	318016	T/2	1.51	1.79	1.24	1.58	--	--	--	--	--	--	--	--
0.154	0.42	318015	T/2	1.50	1.67	1.40	1.61	--	--	--	--	--	--	--	--
0.162	0.49	317903	T/2	1.44	1.79	1.34	1.52	--	--	--	--	--	--	--	--
0.162	1.1	340429	T/2	1.42	1.76	1.32	1.50	--	--	--	--	--	--	--	--
0.180	4.6	340395	T/2	1.42	1.79	1.38	1.62	1.59	1.78	1.42	1.70	--	--	--	--
0.261	0.60	340427	T/2	1.46	1.84	1.28	1.50	--	--	--	--	--	--	--	--
0.265	0.88	317996	T/2	1.59	1.75	1.26	1.40	--	--	--	--	--	--	--	--
0.625	6.9	317997	T/2, W/4	1.46	1.76	1.32	1.55	1.41	1.69	1.31	1.54	--	--	--	--
0.790	1.7	340254	T/2, W/2	1.61	1.80	1.32	1.51	--	--	--	--	--	--	--	--
1.200	3.9	318139	T/2, W/2	1.38	1.77	1.29	1.49	--	--	--	--	--	--	--	--
1.438	6.4	317957	T/2, W/2	1.42	1.78	1.27	1.49	--	--	--	--	--	--	--	--
2.180	15.5	318140	T/4, W/4	1.37	1.77	1.36	1.61	1.41	1.71	1.37	1.62	1.24	1.59	1.33	1.63
			T/2, W/2	1.38	1.80	1.39	1.63	1.40	1.78	1.36	1.62	1.23	1.63	1.33	1.63

\* T - Thickness, W - Width

† Producer B; all others from Producer A

NOTE: L - Longitudinal; LT - Long-Transverse

**TABLE IX**  
**RATIOS OF BEARING TO TENSILE PROPERTIES OF ALUMINUM ALLOY EXTENSIONS  
 IN THE "BEAT-TREATED-BY-15% IR TEMP".**  
 [ARM(615)-7580]

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TABLE XXX  
PARTIES AND THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS  
[AF53(625)-2590]

Alloy and Temper	Sample		Number	Direction <sup>a</sup>	Location <sup>b</sup>	Strain-Rate-Hellexed Stretched Fibers	Tensile Properties			Shear Ultimate Stress	Ultimate Stress at 0.2% Strain	Yield Stress at 0.5% Strain
	Section Cross- Area, in. <sup>2</sup>	Sectional Thickness, in.					Tensile Ultimate Strength	Tensile Yield Strength	Compressive Ultimate Yield Strength			
2014-T6510	1.657	2.6	318146	L	W/2/tw/4	1.01	1.01	1.01	1.01	0.98	0.97	0.97
2024-T5510	0.525	1.9	318020**	L	W/2/tw/4	0.98	1.05	1.05	1.05	—	—	—
0.815	2.9	340418**	L	W/2/tw/4	0.95	0.95	0.95	1.00	0.99	1.00	0.99	
0.150	5.6	318077	L	W/2/tw/4	1.03	1.03	0.97	1.01	0.99	1.01	0.98	
1.450	7.3	318021**	L	W/2/tw/4	1.01	0.97	0.97	1.01	0.97	1.01	0.98	
1.705	4.8	340223	L	W/2/tw/4	0.99	1.01	1.01	1.01	0.98	1.00	0.97	
2.520	8.8	318133**	L	W/2/tw/4	1.00	1.01	1.00	1.01	1.00	1.02	1.02	
4.000	24.0	3423214	L	W/2/tw/4	1.03	1.02	1.01	1.01	0.98	0.97	1.02	
2.760	29.6	318048	L	W/2/tw/4	0.98	0.97	0.98	1.00	0.98	1.05	1.05	
4.500	30.7	340288	L	W/2/tw/4	1.03	1.06	1.06	1.01	0.99	0.96	1.08	
2024-T8510	0.525	1.9	318024**	L	W/2/tw/4	0.98	0.98	0.98	1.00	0.99	1.01	1.01
0.815	3.9	340419**	L	W/2/tw/4	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
1.150	5.6	318078	L	W/2/tw/4	1.01	1.01	1.01	1.00	1.00	1.00	1.00	
1.450	7.3	318025**	L	W/2/tw/4	1.00	1.00	1.00	1.00	0.99	1.00	1.01	

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L - Longitudinal: L<sub>9</sub> - Long Transverse

- यहाँ तक की जांच करने का अधिकारी द्वारा नियमित रूप से आवश्यक होता है।

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Producer B; all others from Producer C.

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TABLE XXX (continued)  
RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS  
[AF33(615)-5580]

Alloy and Temper	Section Thickness, in.	Sample Cross- Sectional Area, in. <sup>2</sup>	Number Direction	Location	Tensile Ultimate Stress	Tensile Yield Stress	Compressive Yield Stress	Shear Ultimate Stress	Bearing		
									Tu/2/tw/4	Tu/2/tw/4	Tu/2/tw/4
2024-T310	1.705	4.8	340169	L	Tu/2/tw/4	1.00	1.00	0.98	1.01	1.02	1.03
	2.530	8.8	340420*	L	Tu/2/tw/4	1.00	1.01	1.00	0.99	0.96	1.00
	2.750	29.6	318079	L	Tu/2/tw/4	0.98	0.98	0.99	0.97	0.99	0.97
	4.000	24.0	340225	L	Tu/2/tw/4	1.01	1.02	0.98	1.05	1.07	1.05
	4.500	30.7	340389	L	Tu/2/tw/4	0.98	0.98	0.98	0.98	0.97	0.97
	6061-T6510	1.00*	340422**	L	Tu/2/tw/4	0.97	0.98	0.97	1.00	0.98	0.98
	1.240	2.7	317907	L	Tu/2/tw/4	1.01	1.01	1.02	0.98	1.00	0.97
	3.000	15.0	340226	L	Tu/2/tw/4	0.98	0.98	0.97	1.00	0.98	0.98
	6.500	33.2	317897	L	D/2/tw/4	0.98	1.02	0.98	0.97	0.98	0.97
7075-T6510	0.975	7.2	340155	L	Tu/2/tw/4	0.98	0.97	0.98	1.01	1.03	1.01
	1.188	27.1	317860	L	Tu/2/tw/4	0.98	0.98	0.98	0.98	0.98	0.98
	2.000	3.1	317861	L	D/2/tw/4	0.98	0.98	0.98	0.98	0.98	0.98
	2.190	1.1	318150*	L	Tu/2/tw/4	0.97	0.96	1.01	1.02	1.02	1.02
	2.750	8.2	340404	L	Tu/2/tw/4	0.98	0.98	0.98	1.00	1.02	1.02
	3.040	13.8	318150**	L	Tu/2/tw/4	0.97	0.98	0.98	0.98	0.97	0.98
				L		0.99	1.00	0.99	1.00	0.98	0.97

\* Longitudinal; L = Long-Transverse  
\*\* Transverse; L = Long-Transverse  
: Edgewise bearing specimens; others - flatwise specimens

\*\* Producer B: all others from Producer A



TABLE XXI  
RATIO OF BEARING PROPERTIES IN THE EXERCISE DIRECTION TO THOSE IN THE  
PLATE DIRECTION FOR ALUMINUM ALLOY EXTENSIONS

Alloy and Temper	Sample Number	Section Cross- Sectional Area, in. <sup>2</sup>		Exercise/Plastic		Section Cross- Sectional Area, in. <sup>2</sup>	Loca- tion Number	Loca- tion Number	Exercise/Plastic	
		Longi- tudinal	Trans- verse	BTS (2) /BTS (P)	BTS (2) /BTS (P)				Thickness, in.	Direction
2024-T5510	1.150	5.6	1.18077	T/2, W/4	0.91	0.97	7075-T6510	1.188	27.1	317860 T/2, W/4
**	1.450	7.3	317946	T/2, W/4	0.97	0.97				0.86
1.705	4.8	340213	T/2, W/2	0.97	0.98				0.87	
2.500	6.8	318133	T/2, W/4	0.98	1.00				0.88	
4.000	24.0	340214	T/2, W/4	0.97	0.98				0.89	
2.760	29.1	318048	T/2, W/2	0.97	0.98				0.90	
4.500	30.7	340286	T/2, W/4	0.97	0.98				0.91	
			T/2, W/2	0.97	0.98				0.92	
2024-T5510	1.150	5.6	318078	T/2, W/4	0.8	0.97	7075-T75210	1.000	5.7	316039 T/2, W/4
**	1.450	7.3	317895	T/2, W/4	0.8	0.97				0.93
1.705	4.8	340169	T/2, W/2	0.8	0.98				0.94	
2.500	6.8	340420	T/2, W/4	0.8	0.98				0.95	
2.760	29.1	318079	T/2, W/2	0.8	0.98				0.96	
4.000	24.0	340225	T/2, W/4	0.8	0.98				0.97	
4.500	30.7	340282	T/2, W/2	0.8	0.98				0.98	
			T/2, W/4	0.8	0.98				0.99	
6061-T6510	1.004	2.0	340423	T/2, W/4	0.5	0.96	2024-T42	2.562	6.4	340245 T/2, W/4
1.250	2.7	317907	T/2, W/2	0.5	0.96				0.96	
1.500	4.4	317896	T/2, W/2	0.5	0.96				0.97	
2.000	15.0	340226	T/2, W/4	0.5	0.96				0.98	
6.500	33.2	317897	T/2, W/2	0.5	0.96				0.99	
			T/2, W/4	0.5	0.96				1.00	

\*\* Bearing specimen failed before reaching yield stress

\* D - Diameter

† Longitudinal; L - Transverse

‡ Sample was in the T551 temper

§ Sample was in the T551 temper

|| Sample was in the T551 temper

**TABLE EIGHT**  
RESULTS OF PLASTICITY-INDUCED STRESS-RELIEVED STATIONARY ALLOT EXAMINATIONS  
[UP32(615)-5980]

Sample	Gross Sectional Area, in. <sup>2</sup>	Specimen Length, in.	Specimen Width, in.	Specimen Thickness, in.	Specimen Depth, in.	Depth of Indentation, in.	At Initial Indication of Gross Crack			At 1.5 Per Cent. Specimen Offset		
							Specimen Length, in.	Specimen Width, in.	Specimen Depth, in.	Specimen Length, in.	Specimen Width, in.	Specimen Depth, in.
0.271	0.40	317094	2	1.902	0.271	0.52	1.900	1.200	0.700	0.70	0.30	1.34
0.295	2.8	317092	2	1.902	0.271	0.51	1.900	1.200	0.700	0.70	0.28	1.19
0.510	10.1	317096	1	1.906	0.274	0.55	1.900	1.200	0.700	0.70	0.16	0.57
0.642	5.8	317095	3	2.000	0.300	0.74	2.000	1.700	1.000	1.00	0.62	0.81
1.400	7.3	318021 <sup>a</sup>	1	1.900	0.277	0.57	1.900	1.200	0.700	0.70	0.28	1.18
4.000	20.0	340214	2	1.900	0.277	0.54	1.900	1.200	0.700	0.70	0.22	1.02
7.760	20.6	318048	2	1.900	0.274	0.52	1.900	1.200	0.700	0.70	0.22	1.00

<sup>a</sup> L = longitudinal; T = transverse; i.e., after initial crack initiation at tip of crack, at point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>b</sup> At point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>c</sup> At point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>d</sup> At point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>e</sup> At point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>f</sup> At point of fracture toughness test, i.e., after initial crack initiation prior deviation from linearity.

<sup>g</sup> Producer B.

<sup>h</sup> Producer B, all others are producer A.

<sup>i</sup> Producer B.

<sup>j</sup> Producer B.

<sup>k</sup> Producer B.

<sup>l</sup> Producer B.

<sup>m</sup> Producer B.

<sup>n</sup> Producer B.

<sup>o</sup> Producer B.

<sup>p</sup> Producer B.

<sup>q</sup> Producer B.

<sup>r</sup> Producer B.

<sup>s</sup> Producer B.

<sup>t</sup> Producer B.

<sup>u</sup> Producer B.

<sup>v</sup> Producer B.

<sup>w</sup> Producer B.

<sup>x</sup> Producer B.

<sup>y</sup> Producer B.

<sup>z</sup> Producer B.

<sup>aa</sup> Producer B.

<sup>bb</sup> Producer B.

<sup>cc</sup> Producer B.

<sup>dd</sup> Producer B.

<sup>ee</sup> Producer B.

<sup>ff</sup> Producer B.

<sup>gg</sup> Producer B.

<sup>hh</sup> Producer B.

<sup>ii</sup> Producer B.

<sup>jj</sup> Producer B.

<sup>kk</sup> Producer B.

<sup>ll</sup> Producer B.

<sup>mm</sup> Producer B.

<sup>nn</sup> Producer B.

<sup>oo</sup> Producer B.

<sup>pp</sup> Producer B.

<sup>qq</sup> Producer B.

<sup>rr</sup> Producer B.

<sup>ss</sup> Producer B.

<sup>tt</sup> Producer B.

<sup>uu</sup> Producer B.

<sup>vv</sup> Producer B.

<sup>ww</sup> Producer B.

<sup>xx</sup> Producer B.

<sup>yy</sup> Producer B.

<sup>zz</sup> Producer B.

<sup>aa</sup> Producer B.

<sup>bb</sup> Producer B.

<sup>cc</sup> Producer B.

<sup>dd</sup> Producer B.

<sup>ee</sup> Producer B.

<sup>ff</sup> Producer B.

<sup>gg</sup> Producer B.

<sup>hh</sup> Producer B.

<sup>ii</sup> Producer B.

<sup>jj</sup> Producer B.

<sup>kk</sup> Producer B.

<sup>ll</sup> Producer B.

<sup>mm</sup> Producer B.

<sup>nn</sup> Producer B.

<sup>oo</sup> Producer B.

<sup>pp</sup> Producer B.

<sup>qq</sup> Producer B.

<sup>rr</sup> Producer B.

<sup>ss</sup> Producer B.

<sup>tt</sup> Producer B.

<sup>uu</sup> Producer B.

<sup>vv</sup> Producer B.

<sup>ww</sup> Producer B.

<sup>xx</sup> Producer B.

<sup>yy</sup> Producer B.

<sup>zz</sup> Producer B.

TABLE XXXII (Continued)  
RESULTS OF FAULTY-TO-FAULT TESTS OF S300-2-S-20000 SPACERS  
OF STRESS-RELIEVED STRENGTHENED ALUMINUM ALLOY EXTENSIONS

International. The responses of the other three countries were similar to those of the United States. The Japanese and Canadian populations showed significant inter-annual variation from 1960 to 1970. The Chinese population showed no significant variation from 1960 to 1970.

$\mu = \text{global mean}$  load

estimated  $(P/A + M/C)$ ) expressed at tip of cone.

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$\Sigma$  = thickness, in.  
 $\Delta$  = frame width, in.

$\sigma_{\text{tensile}} + \frac{\sigma_{\text{tensile}}}{E} \cdot \delta_{\text{crack}}$  = actual crack length, in., plus plastic-zone correction factor, i.e.,

TABLE XXXII (Continued)  
SECTION OF STRENGTH-REDUCING TESTS OF SINGLE-SITE EXTRUSION  
STRESS-RELIEVED STERILIZED ALUMINUM ALLOY EXTRUSIONS  
[ASTM D-651 - 5500]

**III. -** **TESTS OF HYPOTHESES** **TESTS OF HYPOTHESES** **TESTS OF HYPOTHESES**

P/B = Combined P/A +  $\frac{P}{R}$        $R$  = Reaction at end of crack  
 H = Maximum load

ASTM D-2857-62, ref. ASTM STP 411.

BRUNSWICK, GEORGE, JR.,  
BOSTON, MASS., 1900.

$\sigma = \sigma_0 + K_{cr}^c$  = actual crack length, in., plus plastic-zone correction factor, in.

AP-51(65-1)2600  
FBI - LOS ANGELES

Sample	At Initial Indication of Crease Growth				At 2 Per Cent Seaward Offset			
	Section Cross- Sectional Area, in. <sup>2</sup>	Section Direction and Number (See Fig. 7)	Width (in.)	Thickness (in.)	Crease Length (in.)	Crease Width (in.)	Crease Depth (in.)	Crease Angle (in.)
0.300	6.3	318004	3.2	1.1	0.925	0.26	0.16	1.84
			3.2	1.1	0.925	0.26	0.16	1.84
			3.2	1.1	0.925	0.26	0.16	1.84
			3.2	1.1	0.925	0.26	0.16	1.84
1.225	21.2	318005*	3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84
1.225	21.2	318006*	3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84
			3.2	1.1	1.450	1.63	0.20	1.84

b - Longitudinal,  $\tau =$  100000  
At start of fracture-toughness test, i.e., after fatigue crackling  
Nature of Fracture Indication: Clear Pop-in, below material loss; without significant prior deviation from linearity

2 - INFLUENZA VIRUS

$$F_2 = \left[ -1.99 \cdot 10^{-3} + 32 \cdot 10^{-6} \cdot (t - 11) \right] \cdot \exp \left( -0.5 \cdot (t - 11) \right)$$

ESTATE PLANNING IN U.S.

DR. VIGEN, JR.  
E.?

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TABLE XXXIV  
RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED  
STRENGTHENED ALUMINUM ALLOY EXTRUSIONS

[AR3(615)-3580]

Alloy	Section In.	Thickness, In.	Number	P/R <sup>a</sup>	Date <sup>b</sup>	Exposure: 3.5% NaCl Solution in Aluminate Immersion Sustained - 75° Field Strength Long Duration	Per cent Loss in Tensile Strength <sup>c</sup>			Short Duration		
							Conventional			Per cent Loss in Tensile Strength <sup>c</sup>		
							P/R <sup>d</sup>	Date <sup>e</sup>	Percent	P/R <sup>f</sup>	Date <sup>g</sup>	Percent
2124-T6510	0.250	.340154	0/2	75	--	2/2	2/2	2/2	--	--	--	--
	0.628	.340486										
	1.755	.340487										
2024-T7510	0.256	.317942	0/2	84	29	0/2	84	31 (OK 84)	22	2/2	6.6	6.6
	0.510	.317926	0/2	84	18	1/2	84	7.7	42	2/2	6.6	6.6
	0.950	.317944*	0/2	84	14	2/2	84	12.6	--	1/2	40 (OK 84)	40 (OK 84)
	1.220	.317946*	0/2	84	23	2/2	84	2.5	--	2/2		
	2.750	.318048	0/2	84								
	4.000	.340274*	0/2	75								
2024-T8510	0.255	.317940	0/2	84	5	0/2	84	8	--	--	--	--
	0.510	.317942	0/2	84	6	0/2	84	9	17	0/2	84	84
	0.950	.317943*	0/2	84	6	0/2	84	10	17	0/2	84	84
	1.220	.317945*	0/2	84	6	0/2	84	17	17	0/2	84	84
	2.750	.318079	0/2	84	9	0/2	84	75				
	4.000	.340275*	0/2	75								
6061-T6510	0.215	.317951	0/2	84	0	0/2	84	0	0	0	0	0
	0.375	.317952	0/2	84	0	0/2	84	0	0	0	0	0
	1.220	.317957	0/2	84	0	0/2	84	0	0	0	0	0
	3.000	.318096	0/2	84	0	0/2	84	0	0	0	0	0
	3.000	.340227	0/2	75	75	0/2	75	75		0/2	84	84
7075-T6510	0.375	.317954	0/2	84	7	1/2	17 (OK 84)	7	--	--	--	--
	0.625	.317959	0/2	84	7	0/2	84	28	28	2/2	6.6	6.6
	0.950	.340255*	0/2	84	7	0/2	84	1.2	8 (OK 84)	18	2/2	6.6
	1.220	.317960*	0/2	84	7	0/2	84	4.4	--	2/2	6.6	6.6
	2.190	.318137	0/2	84	5	0/2	84	0	0	0	0	0
	2.190	.318138	0/2	84	0	0/2	84	0	0	0	0	0
7075-T7510	0.275	.317900	0/2	84	0	0/2	84	0	0	0	0	0
	0.525	.317910	0/2	84	0	0/2	84	0	0	0	0	0
	1.220	.340228*	0/2	28	0	0/2	84	28	28	0	0	0
	2.090	.340292	0/2	28	0	0/2	84	28	28	0	0	0
7079-T6510	0.251	.340253	0/2	78	0	0/2	84	28	28	0	0	0
	0.625	.317997	0/2	84	9	1/2	81 (OK 84)	14	--	2/2	4.4	4.4
	1.220	.318139*	0/2	84	10	2/2	81	7.7	--	2/2	4.4	4.4
	2.190	.318140	0/2	84	11	2/2	81	7.7	--	2/2	4.4	4.4

<sup>a</sup> P/R denotes number of specimens failed over number exposed at maximum duration of 84 days.

<sup>b</sup> Tests in progress for periods shown, with maximum duration of 84 days.

<sup>c</sup> Results are average values for tension tests of specimens which did not fail by stress-corrosion cracking.

<sup>d</sup> Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens.

<sup>e</sup> The directionality of these sections is being determined metallographically.

<sup>f</sup> Failure occurred outside the reduced section beneath the protective coating used to isolate all parts of the stressing frame.

<sup>g</sup> Accumulated corrosion products prevented detection of these failures until specimens were chemically cleaned at termination of the exposure period.

TABLE XXXV  
RESISTANCE TO STRESS-CORROSION CRACKING OF ALUMINUM ALLOY  
EXTRUSIONS IN THE HEAT-TREATED-AS-USED TEMPER

[AFSS(615)-3580]

Alloy	Section Thickness, in.	Number	Exposure: 3.5% NaCl Solution by Alternate Immersion Stressied - 75% Yield Strength						Short Tension	
			Longitudinal		Transverse		Long Transverse		Per cent Loss in Tensile Strength††	Per cent Loss in Tensile Strength††
			P/N*	Days††	Strength††	P/N*	Days††	Strength††		
2014-T62	0.300	318094	1/2	248 (OK 84)	11	1/2	248 (OK 84)	13	--	--
2024-T42	0.430	340211	0/2	28		0/2	28	28	2/2	46.46%
	2.562	340215	0/2	28		0/2	28	28	0/2	46
2024-T62	0.430	340242	0/2	28		0/2	28	28	0/2	46
	2.562	340246	0/2	28		0/2	28	28	0/2	46
6061-T62	0.266	318090	0/2	84	0	0/2	84	84	0/2	84
	1.625	318091**	0/2	84	2	0/2	84	84	0/2	84
7075-T6	0.350	318096	0/2	84	6	0/2	84	84	2/2	7.7
	1.225	318098**	0/2	84	4	0/2	84	84	0/2	84
7075-T73X	0.350	318097	0/2	84	2	0/2	84	84	2/2	7.7
	1.225	318098**	0/2	84	1	0/2	84	84	0/2	84
7178-T6	0.403	340219	0/2	28		0/2	28	28	--	--

\* Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens

† P/N denotes number of specimens failed over number exposed.

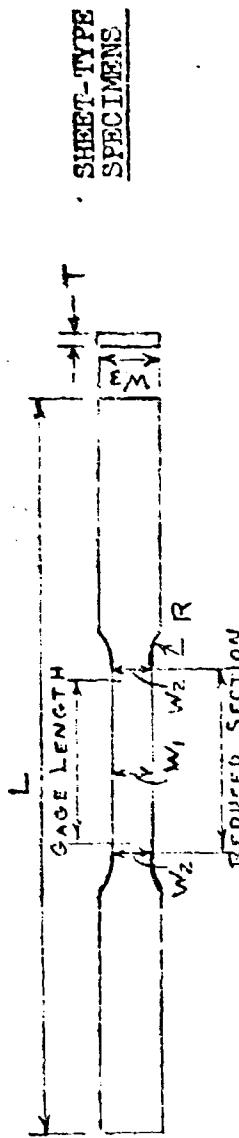
†† Tests in progress; for periods shown, with maximum duration of 84 days.

\*\* Results are average values for tension tests of specimens which did not fail by stress-corrosion cracking.

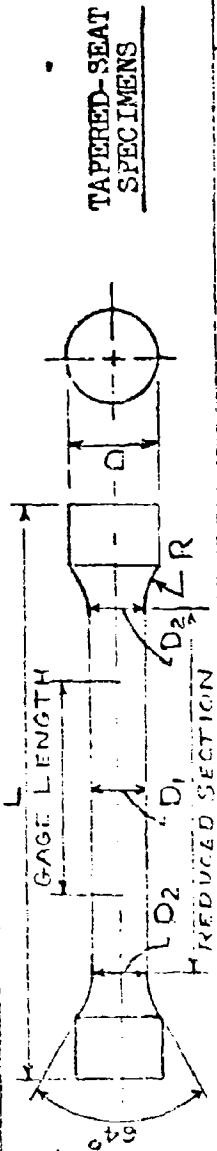
\*\*\* Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens

† Failure occurred outside the reduced section beneath the protective coating used to isolate all parts of the stressing frame.

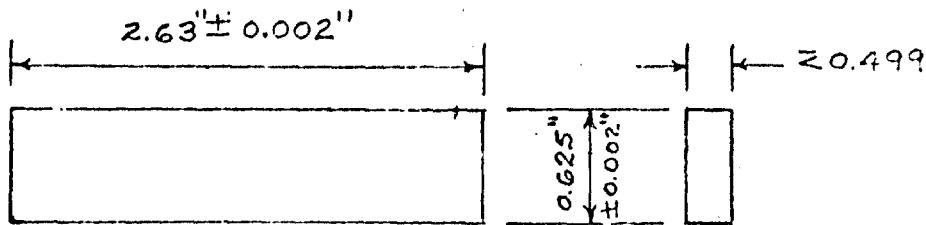
§ Accumulated corrosion products prevented ready detection of these failures. Specimens were chemically cleaned to confirm suspected failure.



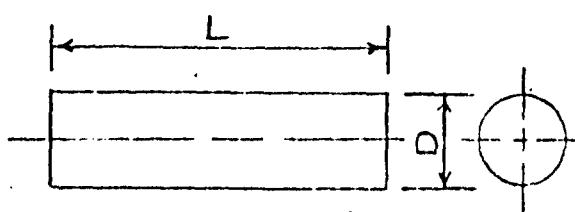
WIDTH, IN.	GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	THICKNESS (T), IN.	LENGTH (L)
$W_1 + W_2 \pm 0.005$	$W_3$	$2.000 \pm 0.002$	$2 - \frac{1}{4}$	$\frac{7}{8}$	$0.499$ 9 MIN.
$0.570 \pm 0.010$	$W_1 + 0.005$	$1.000 \pm 0.002$	$1 - \frac{1}{4}$	$\frac{3}{8}$	$0.250$ 4 MIN.
$0.250 \pm 0.002$	$W_1 + 0.005$	$0.500 \pm 0.002$	$\frac{5}{8}$	$\frac{3}{16}$	$0.125$ 2-1/4 MIN.
$0.125 \pm 0.001$	$W_1 + 0.005$	$0.500 \pm 0.002$			



DIA. IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	DIA. IN.	LENGTH (L)
$D_1 + 0.002$	$2.000 \pm 0.002$	$3 - \frac{1}{8}$	$3/4$	$4 - \frac{3}{4}$
$0.357 \pm 0.004$	$D_1 + 0.004$	$2 - \frac{1}{64}$	$17/64$	$17/32$
$0.250 \pm 0.003$	$D_1 + 0.002$	$1 - 9/16$	$3/16$	$3/8$
$0.160 \pm 0.002$	$D_1 + 0.002$	$0.120$	$15/64$	$2 - 3/8$
$0.125 \pm 0.001$	$D_1 + 0.001$	$25/32$	$3/16$	$1 - 1/2$
				$1 - \frac{1}{4}$

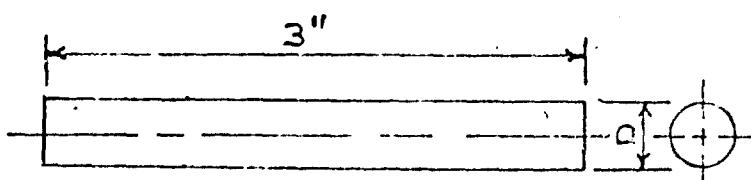


Sheet-Type Compressive Specimen



NOMINAL DIAM, IN.	D, IN.	L, IN.
1/2	0.4980 0.4950	1-29/32 1-27/32
7/16	0.4370 0.4360	1-21/32 1-37/8
3/8	0.3775 0.3735	1-17/32 1-1/2

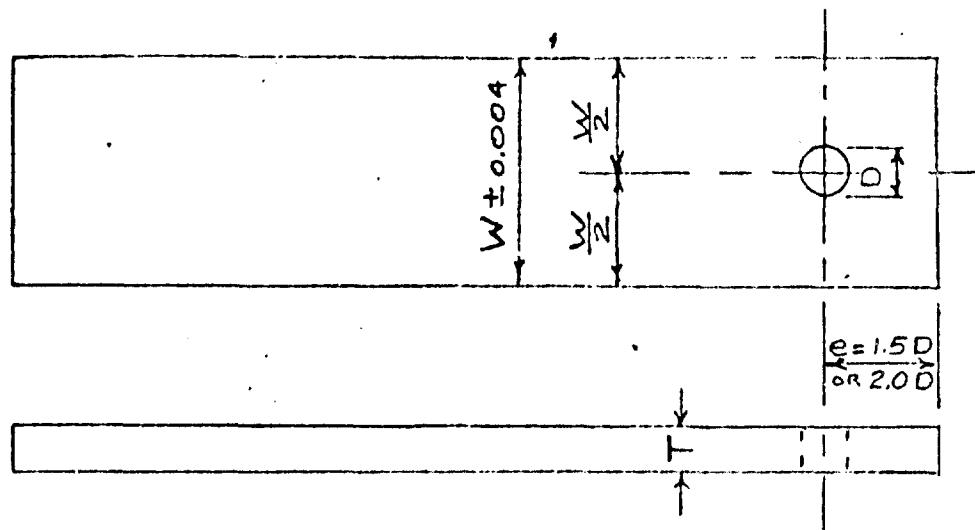
Round Compressive Specimen



Shear Specimen

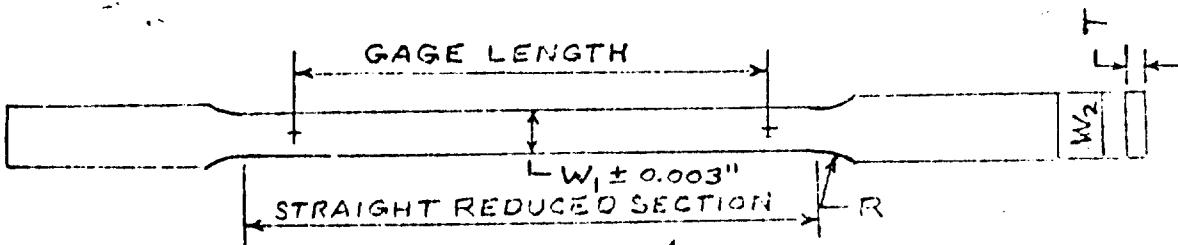
NOMINAL DIAM, IN.	D, IN.
3/8	0.3730 0.3720
1/4	0.2490 0.2480
3/16	0.1965 0.1956

Fig. 2. General Dimensions of Compressive and Shear Specimens



TYPE	T, IN.	W, IN.	D, IN.
A	0.063	1	<u>0.2500</u> <u>0.2305</u>
B	0.040-0.074	1-1/2	<u>0.2500</u> <u>0.2305</u>
C	0.075-0.109	1-1/2	<u>0.3750</u> <u>0.3755</u>
D	0.110-0.250	2	<u>0.5000</u> <u>0.5005</u>

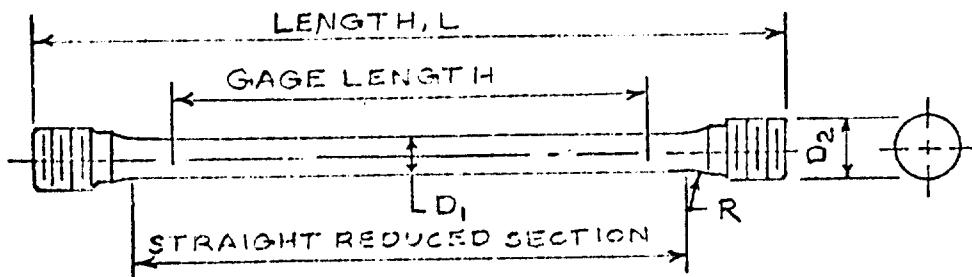
Fig. 3. General Dimensions of Bearing Specimens



WIDTH, IN.	GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	THICKNESS (T), IN.
W <sub>1</sub>	W <sub>2</sub>	L	W <sub>1</sub> ± 0.003"	T
0.500 ± 0.003	3/4	6.000 ± 0.002*	7*	7/8
0.250 ± 0.002	3/8	1.000 ± 0.002	1-1/2	3/8

\* FOR SOME LONG-TRANSVERSE SPECIMENS, GAGE LENGTHS - 4 IN.  
REDUCED-SECTION LENGTHS - 5 IN.

#### Sheet-Type Specimens

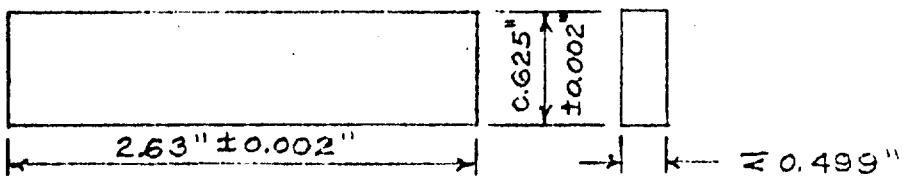


DIAMETER, IN.	GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	LENGTH (L), IN.
D <sub>1</sub>	D <sub>2</sub>	L	L	L
0.500 ± 0.003	3/4	6.000 ± 0.002	7	9-1/2
0.500 ± 0.003	3/4	4.000 ± 0.002	5	7-1/2
0.500 ± 0.003	3/4	2.000 ± 0.002	3+	5-1/2+
0.132 ± 0.003	5/16	2.000 ± 0.002	2-7/8+	5-1/4+
0.375 ± 0.003	9/16	2.000 ± 0.002	2-3/4	5

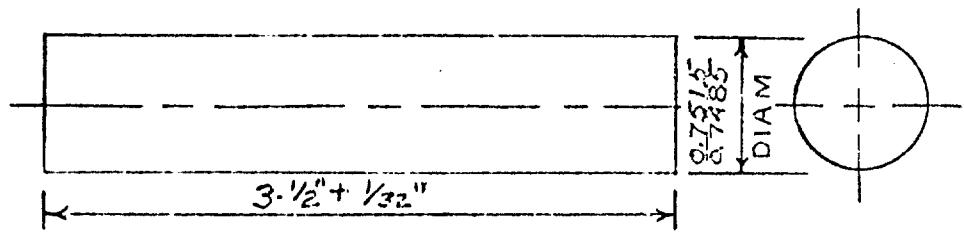
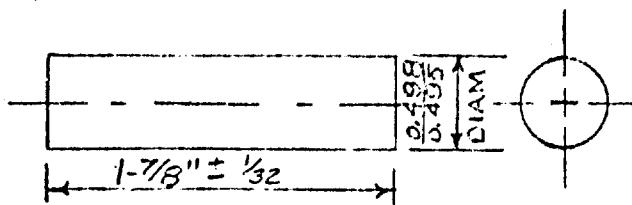
+ FOR SHORTER LONG-TRANSVERSE SPECIMENS, GAGE LENGTHS - 1 IN.,  
REDUCED-SECTION LENGTHS - 1 IN. PLUS TWO TIMES D<sub>1</sub>

#### Round Specimens

Fig. 4 General Dimensions of Tensile Specimens For Modulus and Stress-Strain Tests



Sheet-Type Specimen



Round Specimens

Fig. 5 General Dimensions of Compressive Specimens  
For Modulus and Stress-Strain Tests

Fig. 5

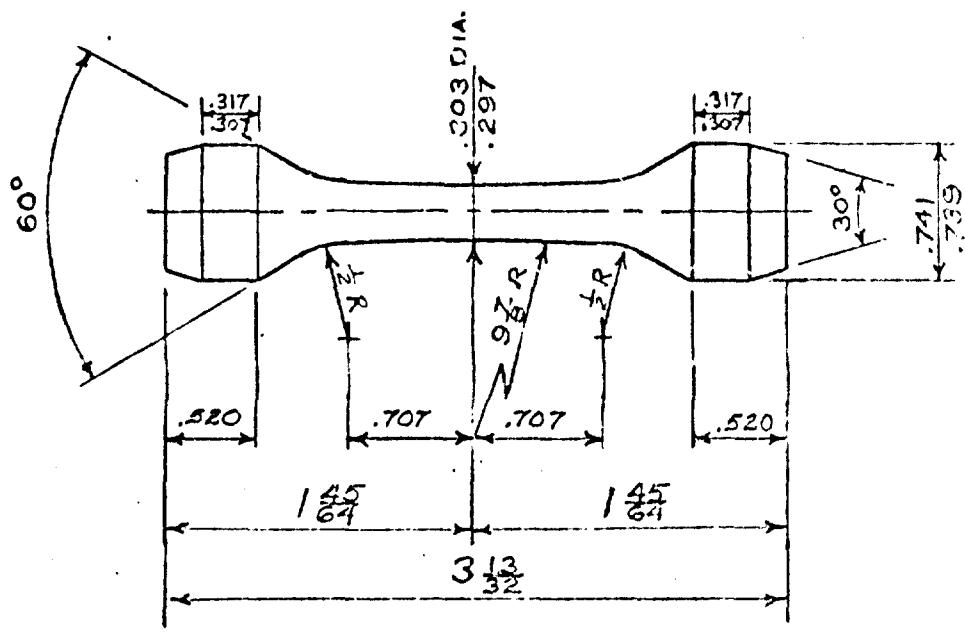


Fig. 6 Axial-Stress Fatigue Specimen

Fig. 6

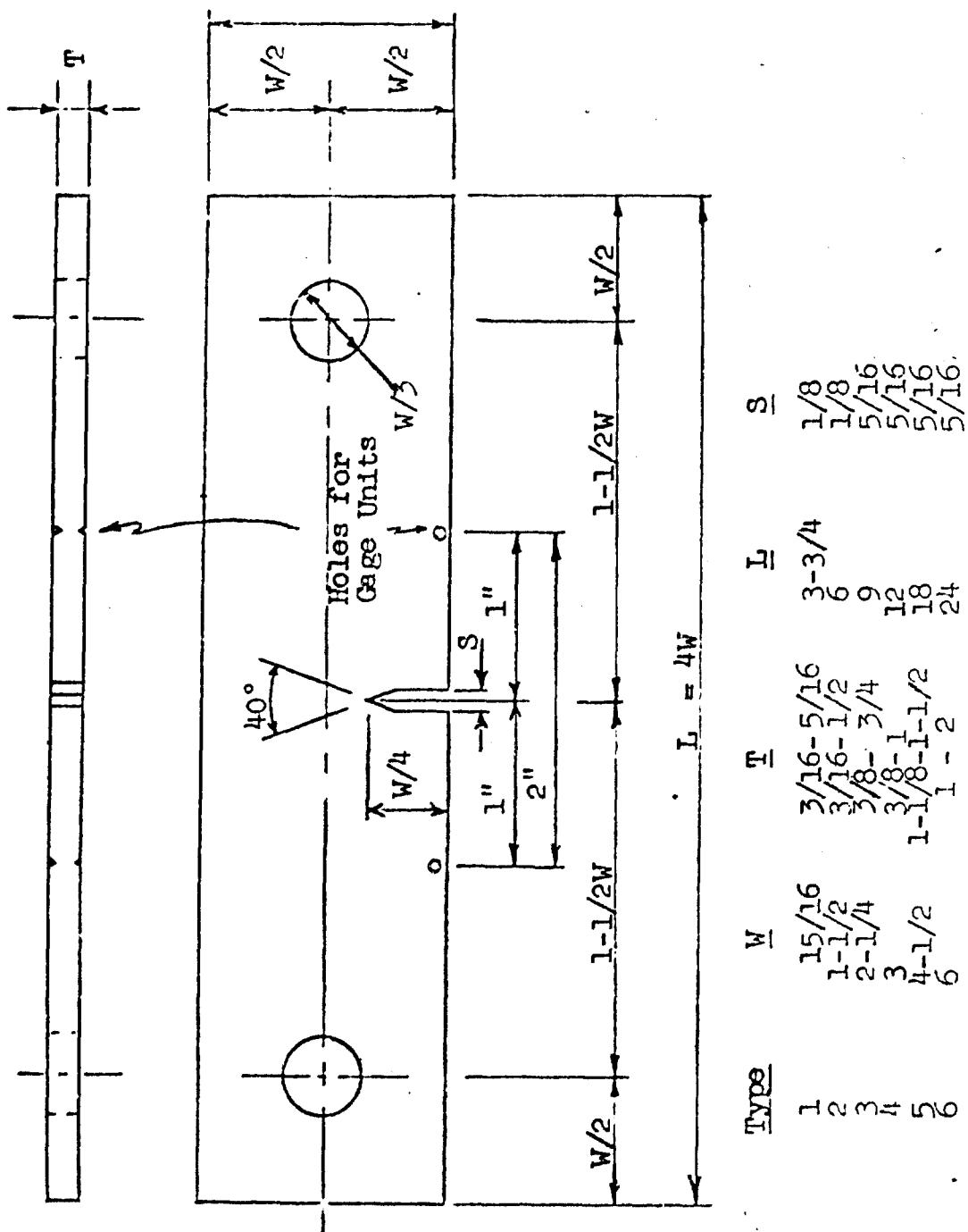
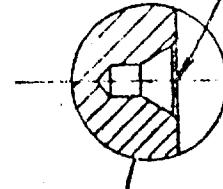


Fig. 7 Single-Edge-Notched Fracture-Toughness Specimens.

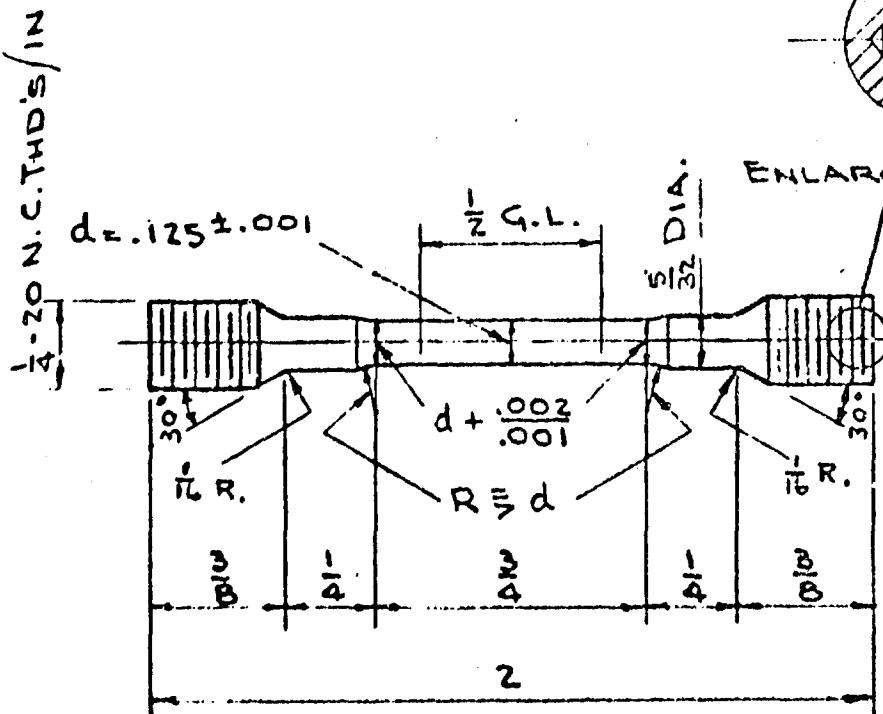
Fig. 7

L-7034-RK

\*731 SIZE 11  
BELL TYPE  
CENTER DRILL  
BOTH ENDS



ENLARGED VIEW



SPECIMEN —   REQ'D

MACHINING SETUP	D-6996-RK
TOOL BIT	D-7647-RK
CENTER & FACE TOOL	D-7444-RK
TEMPLATE	D-6989-RK
DRIVEN	D-6981-RK

ALUMINUM COMPANY OF AMERICA  
ALCOA RESEARCH LABORATORIES  
MECHANICAL ENGINEERING DIVISION  
NEW KENSINGTON, PA.

MECHANICAL TESTING DIVISION

B-DIA. THREADED END TENSILE

SPECIMEN — DETAILS

1-15-58 IMPROVEMENTS D-2276-RK  
DATE NO. REVISION RECORD DR CK

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L-7034-RK	
CHECK <i>R. McClellan</i>	APPR <i>J. L. Howell</i>

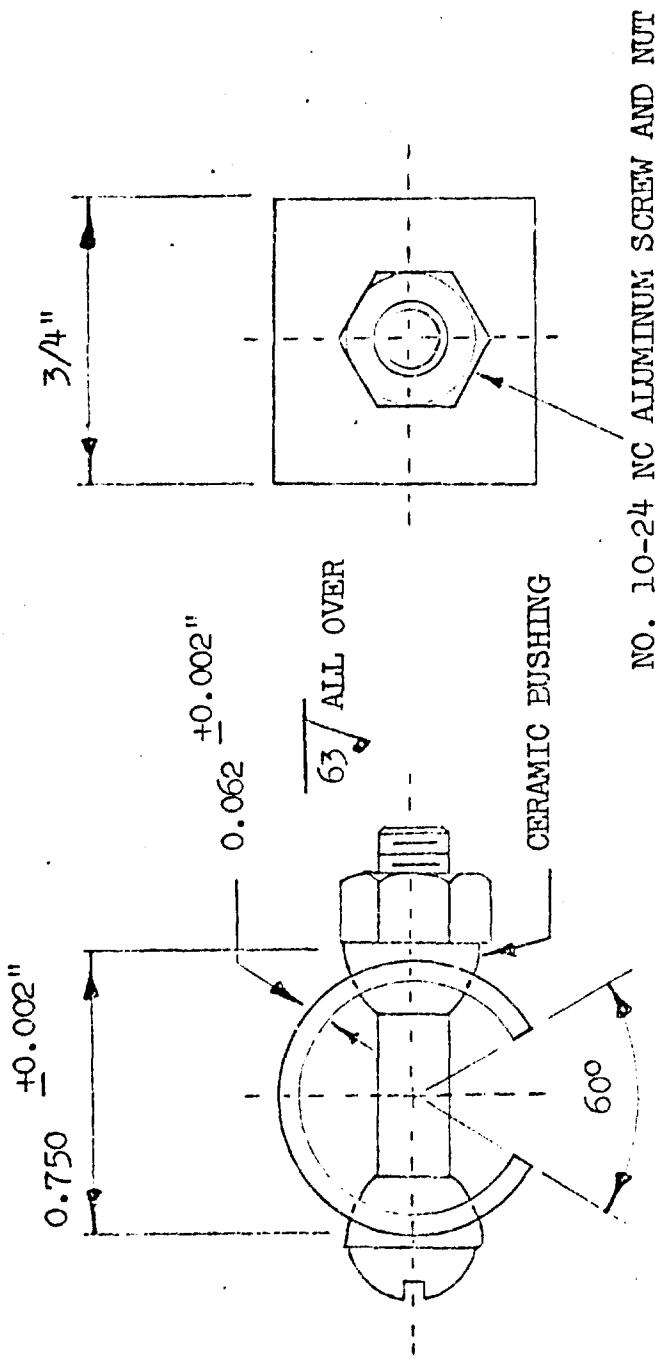


FIGURE 9 . C-RING ASSEMBLY FOR  
PRISM CORROSION TESTS

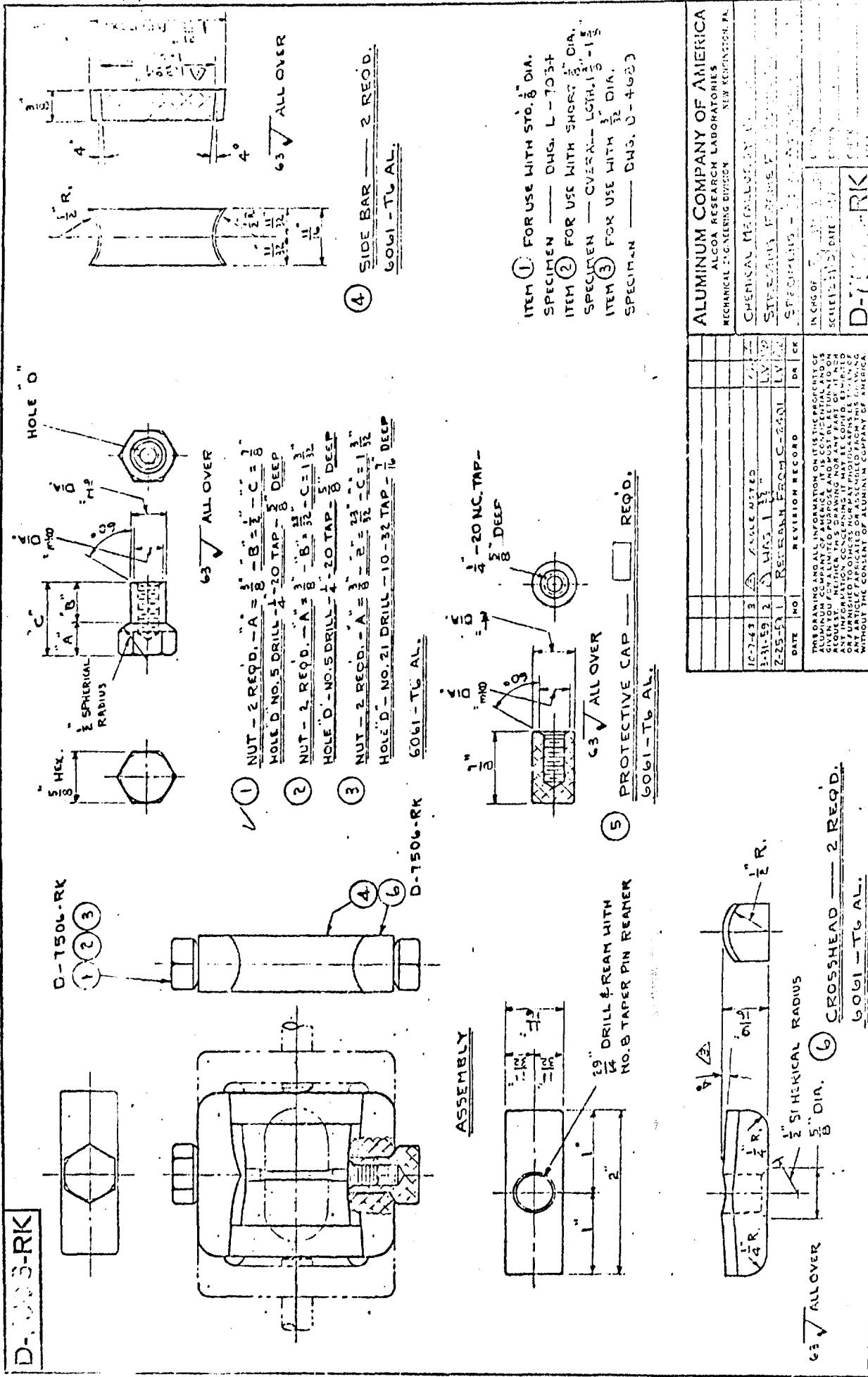
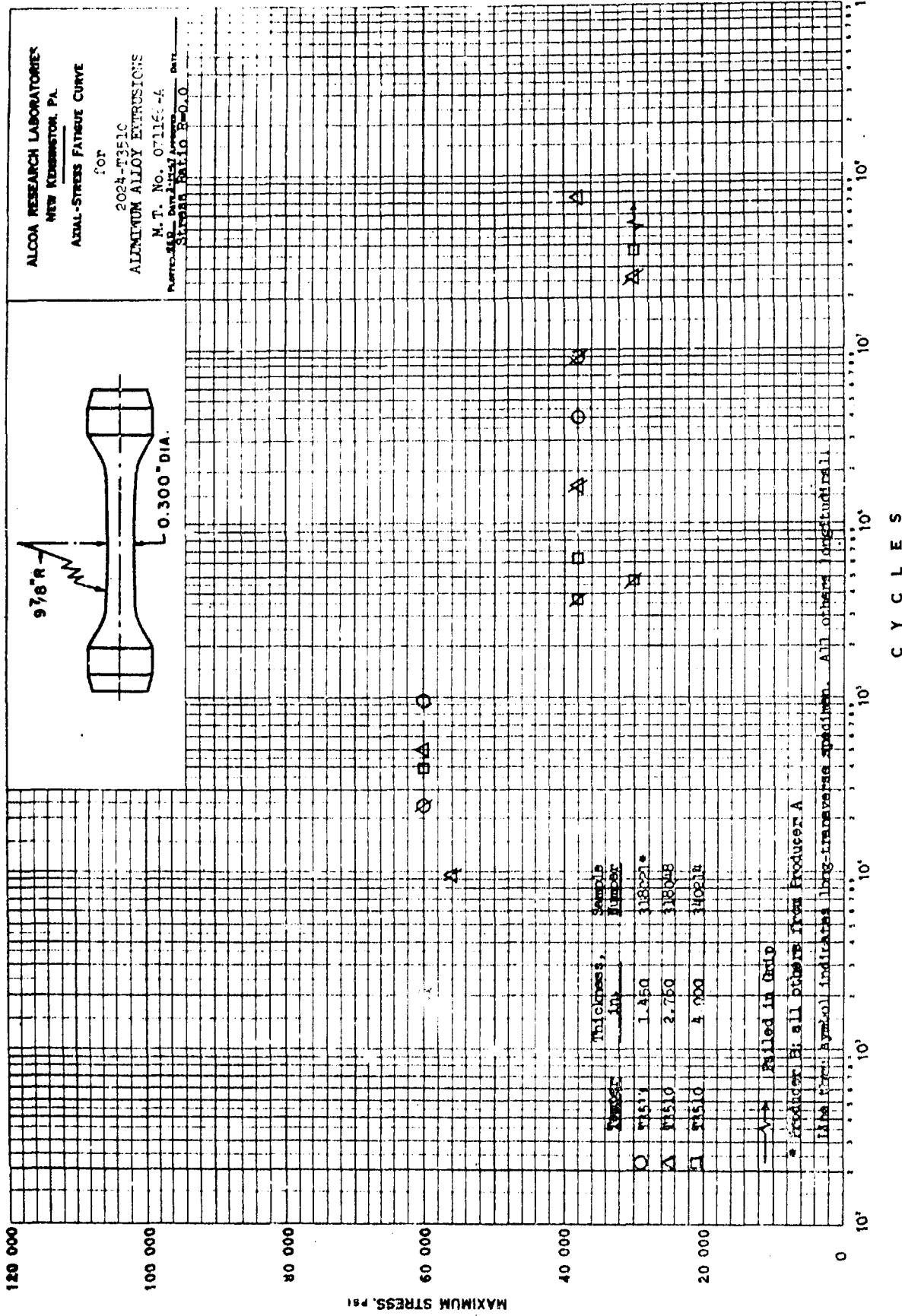


FIG. 20

Fig. 10



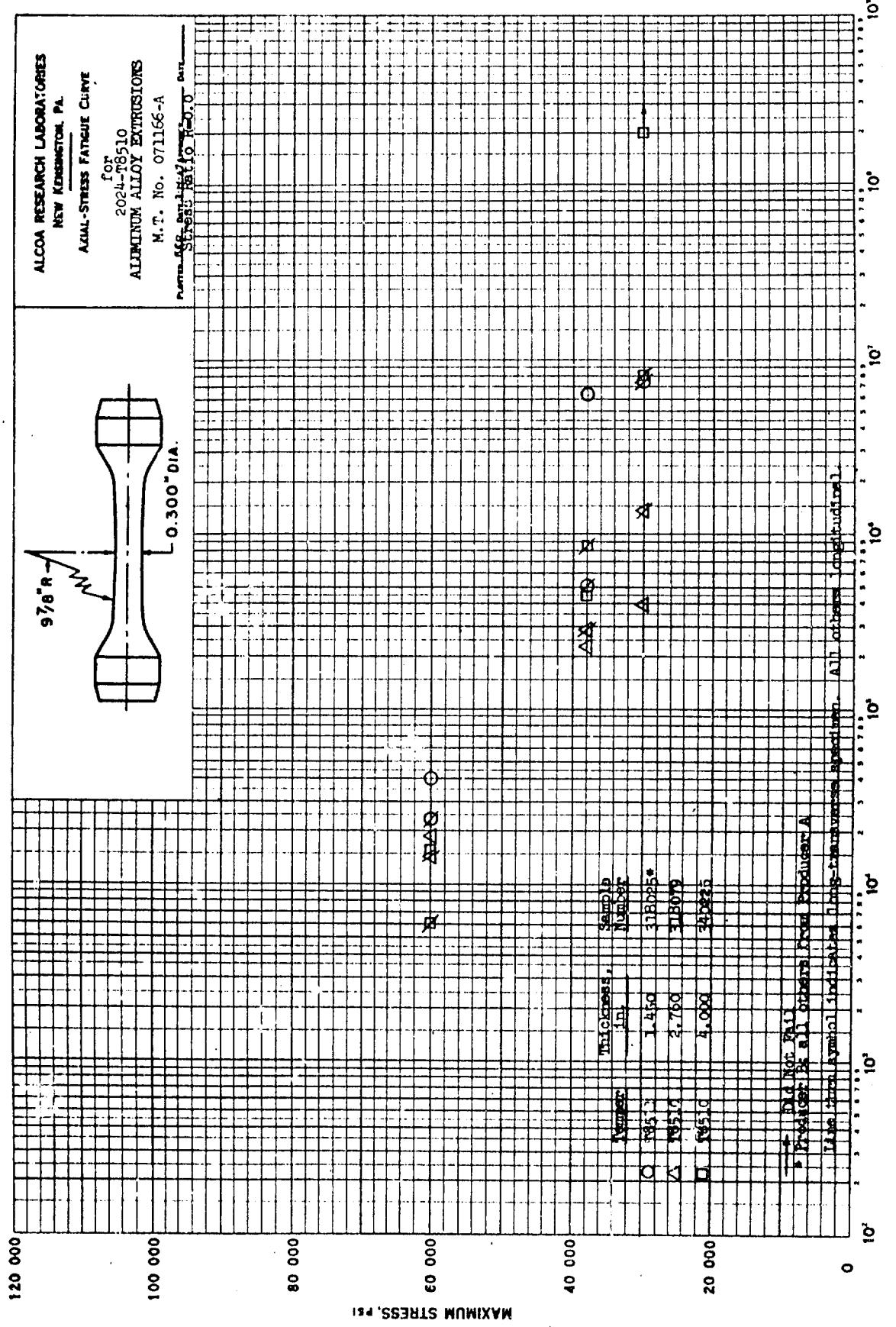


FIG. 12

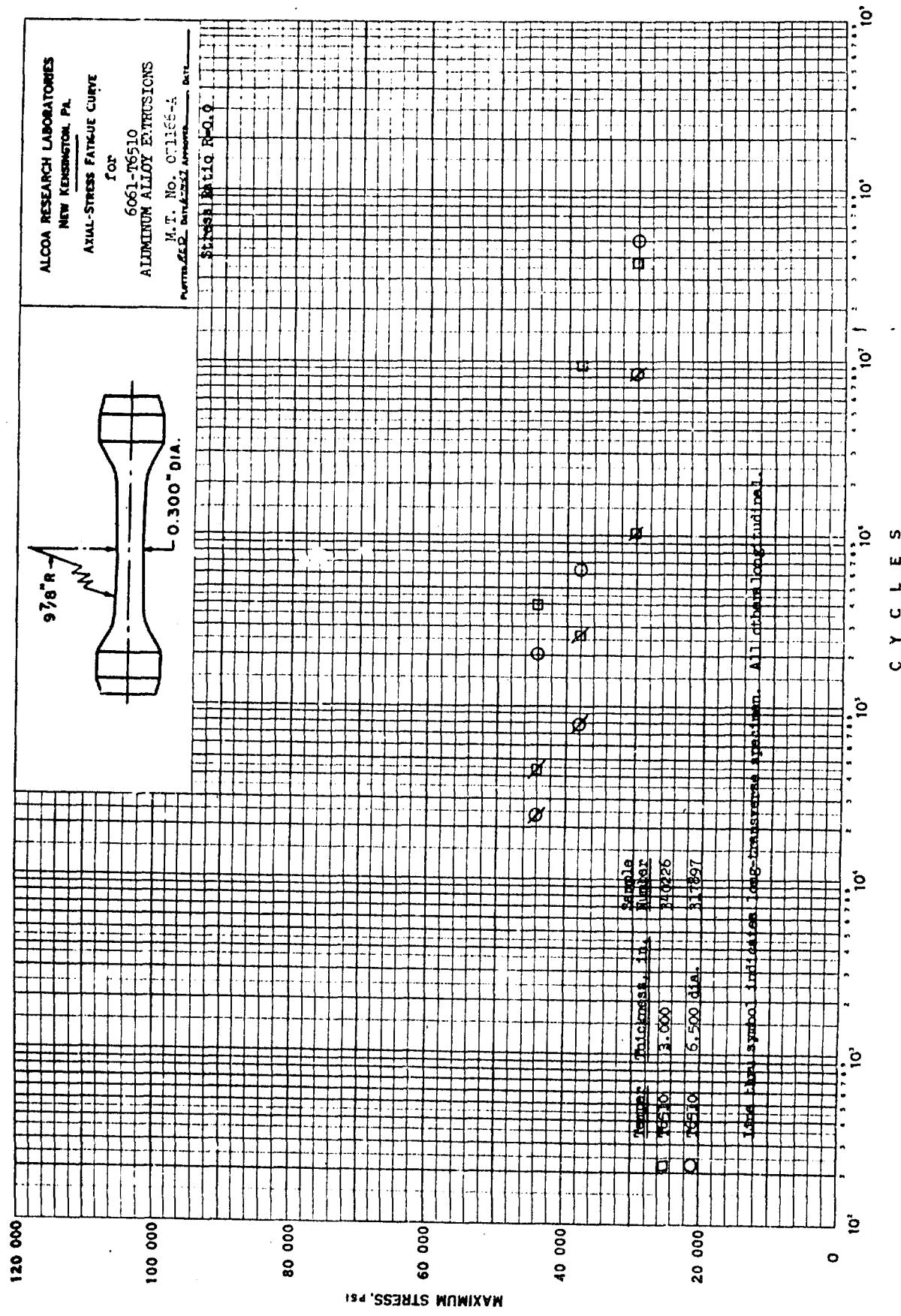


FIG. 13

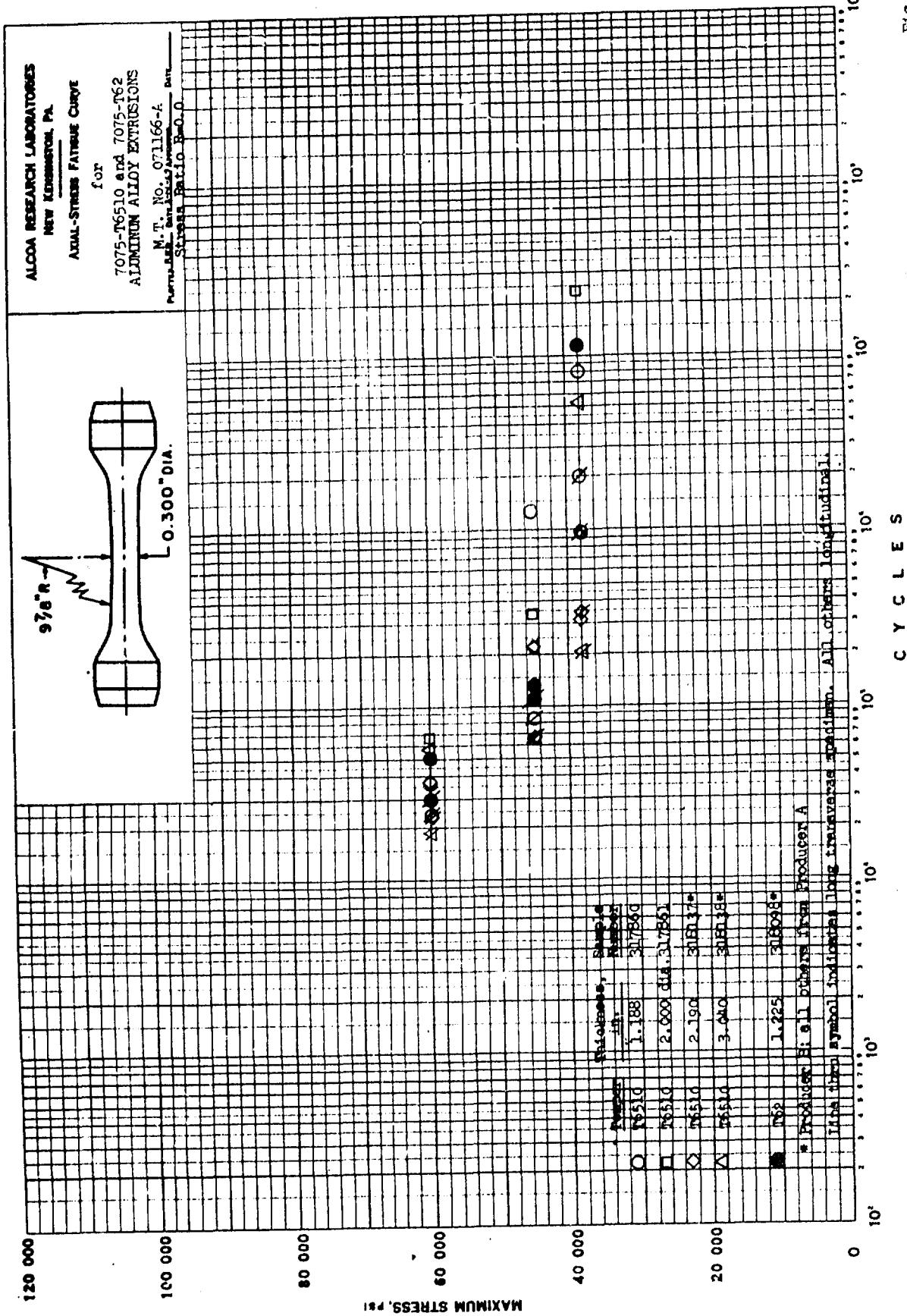


FIG. 14

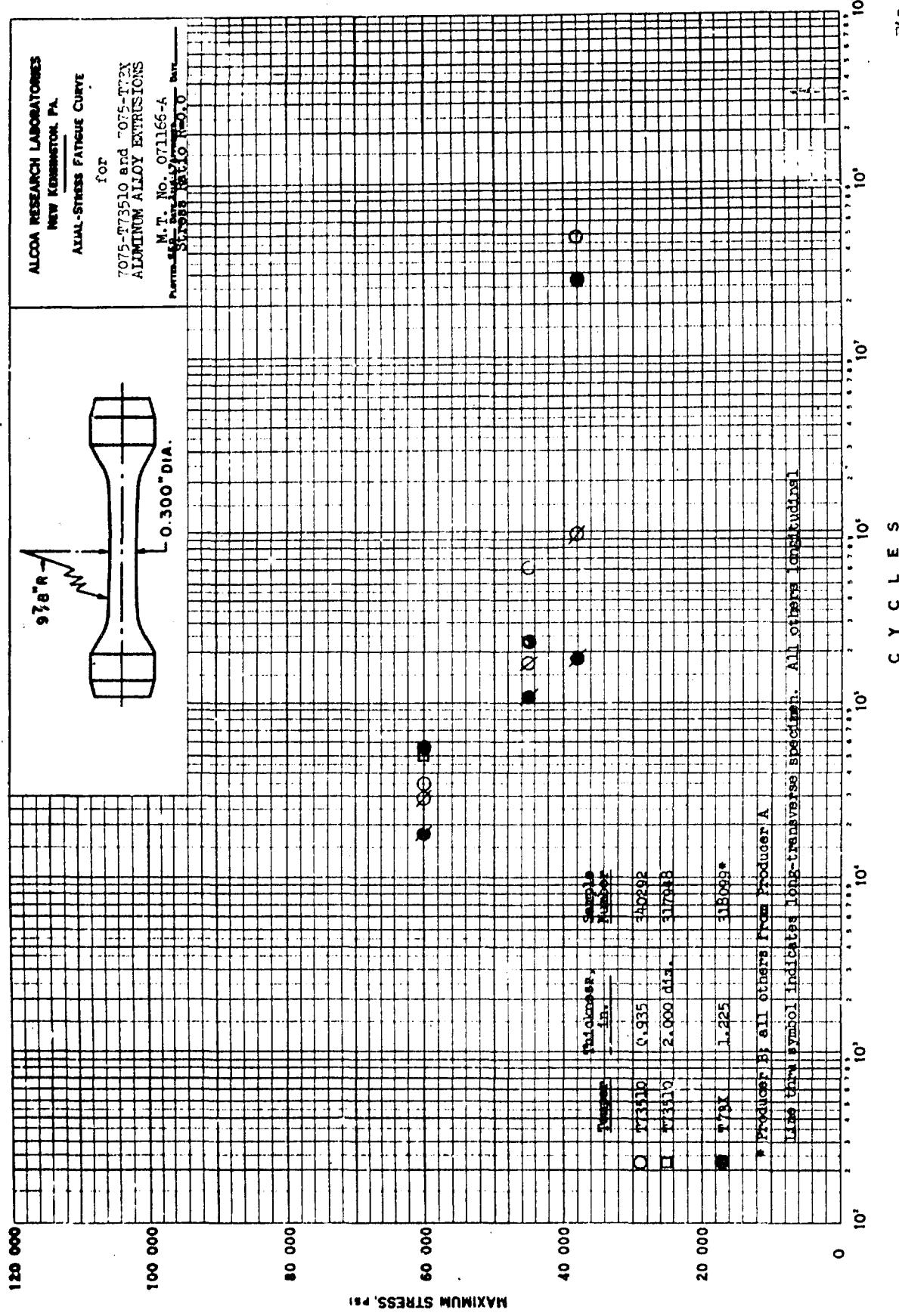


FIG. 15

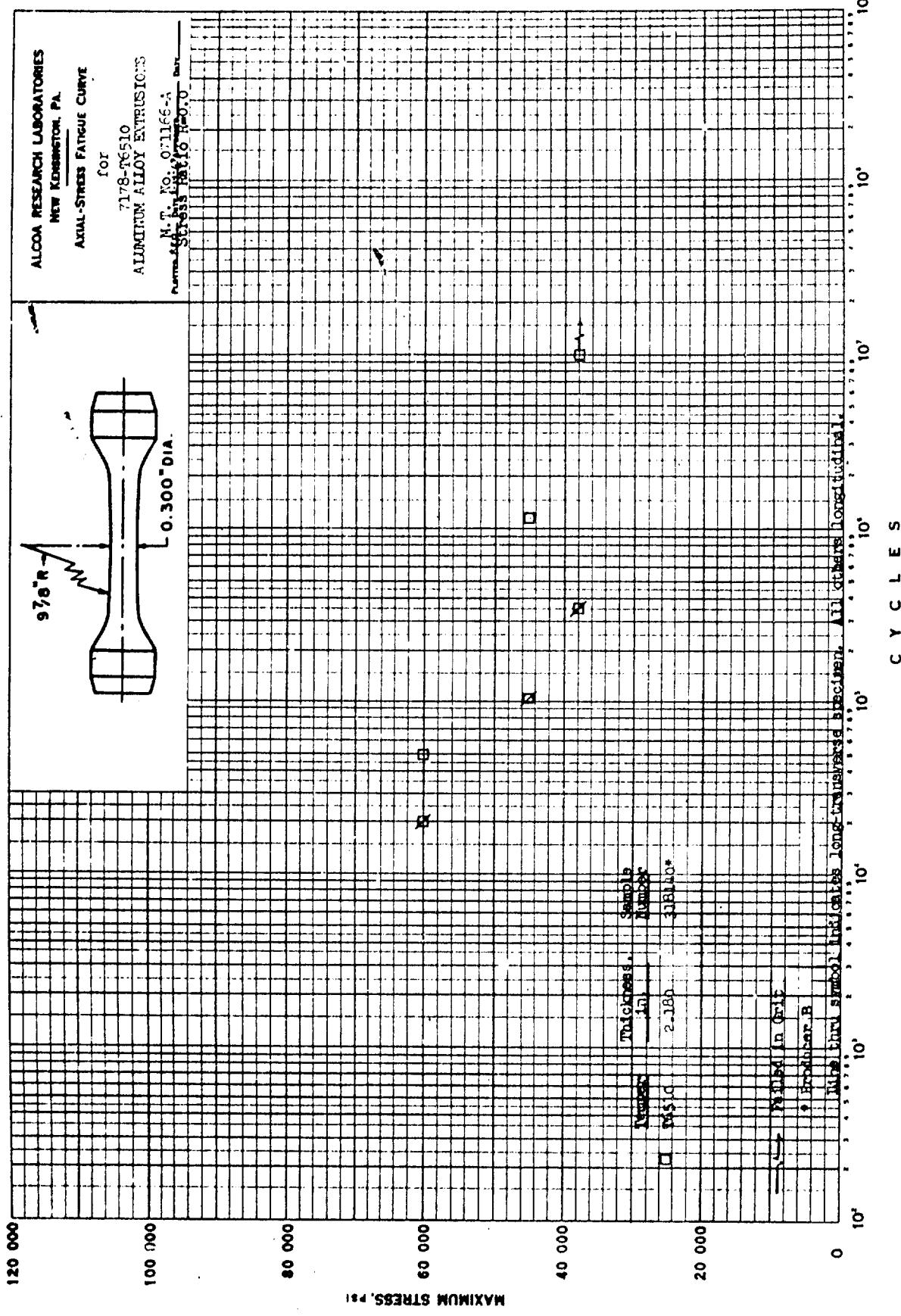


FIG. 16